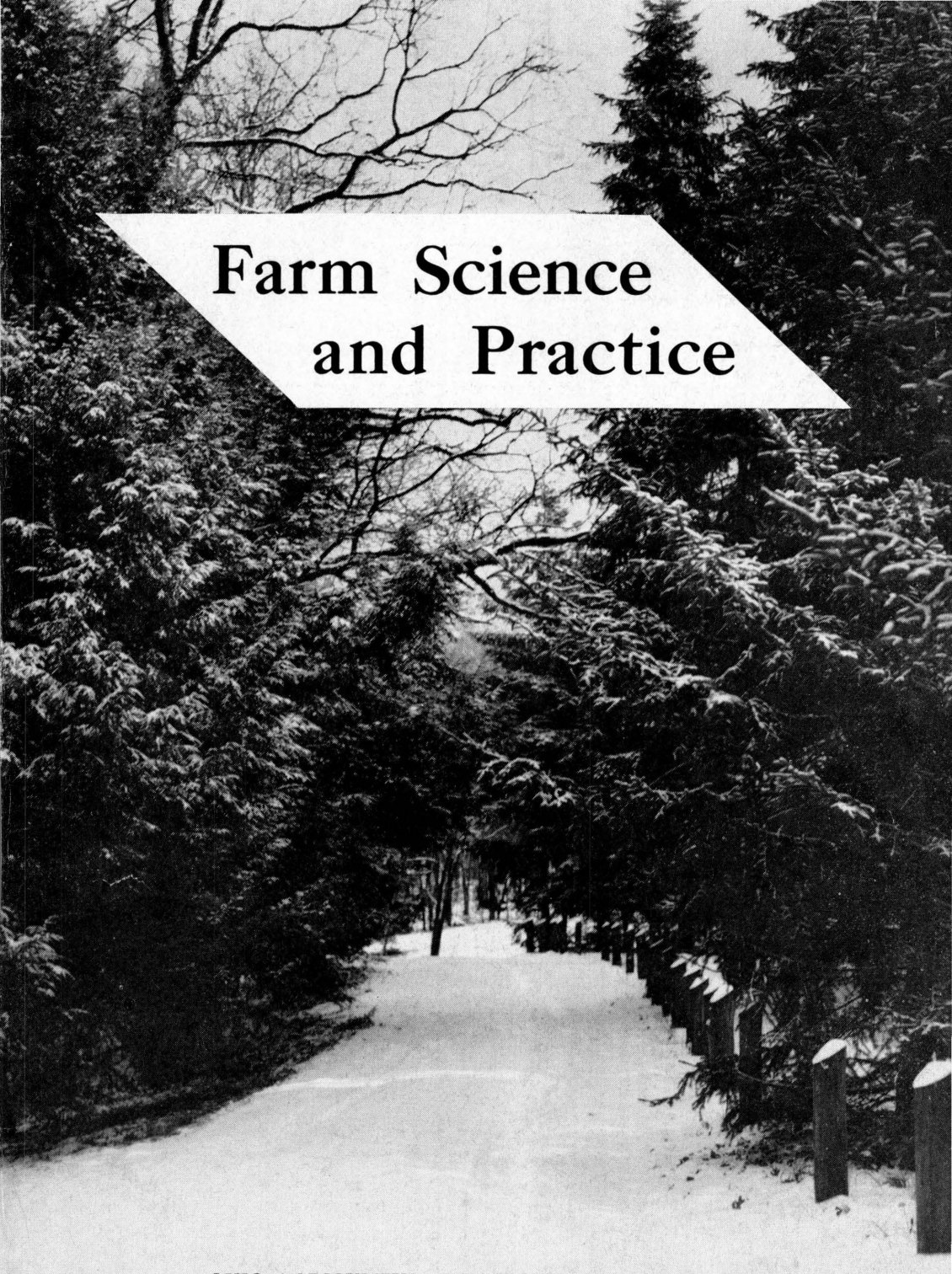

Farm Science and Practice

OHIO AGRICULTURAL EXPERIMENT STATION
WOOSTER, OHIO

Bulletin 674 66th Annual Report February 1948

THE HONORABLE HERBERT S. ATKINSON
PRESIDENT OF THE BOARD OF CONTROL
OHIO AGRICULTURAL EXPERIMENT STATION

DEAR SIR:

I HAVE THE HONOR TO PRESENT TO THE BOARD OF CONTROL FOR TRANSMISSION TO THE GOVERNOR OF OHIO, AS REQUIRED BY LAW, THE SIXTY-SIXTH ANNUAL REPORT OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR THE YEAR ENDED JUNE 30, 1947.

EDMUND SECREST
Director

THE HONORABLE THOMAS J. HERBERT
GOVERNOR OF OHIO

DEAR SIR:

I HAVE THE HONOR TO PRESENT TO YOU THE SIXTY-SIXTH ANNUAL REPORT OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR THE YEAR ENDED JUNE 30, 1947.

HERBERT S. ATKINSON
President, Board of Control

COVER PICTURE: The cover picture of this report is a view down one of the lanes in the Station's Arboretum. The Arboretum covers 55 acres representing plantings of many different species and is always open to inspection by visitors. Dr. Edmund Secrest, who retires as director on December 30, 1947, after 10 years in that position, visualized the Arboretum and carried the plan to completion while he served as State Forester.

FARM SCIENCE AND PRACTICE

Sixty-sixth Annual Report

FOR YEAR ENDED JUNE 30, 1947

The outlook for progress in research has been decidedly favorable during the past year. Increased financial support from the State and the Federal government Flannagan-Hope grant-in-aid has added materially to the Station's resources. On the other hand, the lack of available scientists still constitutes the chief problem in implementing research projects, and will continue to be a handicap until the graduate schools can supply properly trained personnel.

New research projects provided for by the 97th General Assembly of Ohio include a fund of $50,000 for the study of brucellosis or Bang's disease in cattle, a destructive disease in animals and a serious menace to human health. An item of $25,000 was appropriated for the study of vegetable crops, with special reference to muck soils. A suitable acreage of muck land has been proposed as a gift to the state for experimental use. Increased appropriations were received for the statewide soil survey, and for forest research.

Enlargement and improvement of the physical plant is now possible by the allocation of $902,000 for buildings and lands. This will include a new heating plant, horticultural office and laboratory building, swine barn, nutrition laboratory, dairy calf barn, plant pathology headhouse and greenhouse, and agronomy greenhouses. Provision was also made for the purchase of additional land for experimental purposes.

The Station has received the first increment of the Flannagan-Hope research funds, and a program has been set up to cover these funds. Over 20 percent of the increment will support studies of the marketing and distribution of farm products.

During wartime we have learned much in the laboratory that is applicable to agriculture. It remains for us to extend our frontiers into the unknown in search of facts that will develop a more prosperous agriculture, which in turn will accrue to the benefit of all our people.

Edmund Secrest

TOPICS DISCUSSED

FARM INCOME AND LIVING

DAIRYING

LIVESTOCK

POULTRY

FARM ENGINEERING

SOIL MANAGEMENT

SILAGE

FARM CROPS

FRUITS

VEGETABLES

ORNAMENTAL PLANTS

JAPANESE BEETLE

FOOD AND CLOTHING

FORESTRY

ADMINISTRATIVE REPORTS

Farm Income and Living

Cold Storage Locker Plants

The net income of cold storage locker plants depends on several factors as shown by an analysis of records from a large number of locker plants in Ohio for 1944 and 1945. One of the most important of these factors is the size of plants. Both total net income of plants and net income per locker increase as plant size increases. The efficiencies which go with the operation of the larger plants are important enough to affect both total and per locker net income.

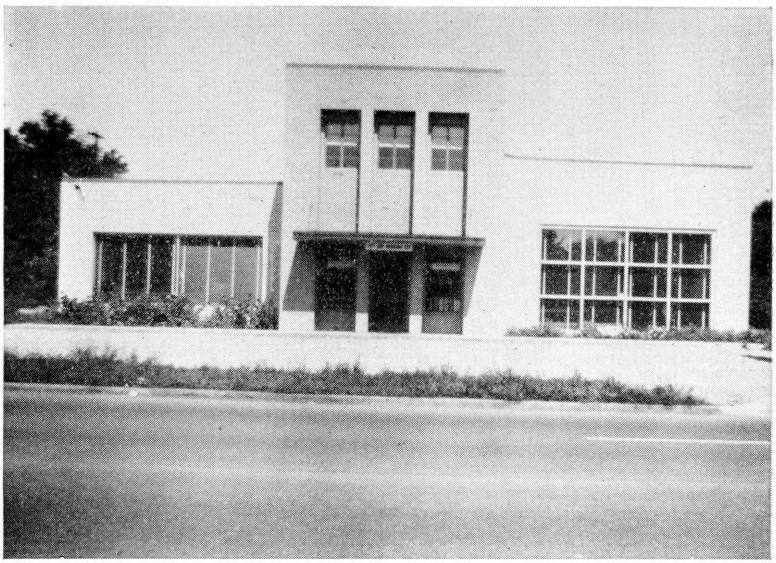

Fig. 1.—In an analysis of locker plant records, large plants showed more efficient operations than small ones

In 1944 the average increase in net income associated with each 100 additional lockers per plant was $745.10, and in 1945 was $850.60. With this same increase in size of plants the net income per locker increased 25 cents for 1944 and 21 cents for 1945. The total net income per locker showed little change in plants above 1,000 lockers which meant that the total net income per plant continued to increase with the increase in size of plant.

With each increase of $1.00 per locker in expenditure for labor the net income per locker decreased by 39 cents in 1944 and by 16 cents in 1945. This was an indication that the income for services was not enough to pay for the labor. An examination of the records for individual plants shows this to be the case with the smaller plants more frequently than with larger plants where the labor force can be adjusted to the seasonal demand for services more easily.

Each additional expense of $1.00 per locker for utilities (heat, light, power, and water) was, on the average, accompanied in 1944 by a decrease of $1.28 and by a decrease of $2.24 in 1945 in net income per locker. In the case of depreciation, the decrease in net income per locker was $1.16 in 1944 and $0.88 in 1945 for each $1.00 increase in charge per locker. Apparently other factors closely related to these costs were largely responsible for the fact that the decrease in net income was greater than the increase in expenditures per locker for these two items.

On the average, the plants with the low total expenses per locker had higher net incomes per locker. In 1944 an increase in total expenditures of $1.00 per locker was accompanied by an average decrease of 23 cents in net income per locker. In 1945 the decrease was 22 cents per locker. With each increase of $1.00 of added gross income per locker the net income was 3 cents higher in 1944 and 17 cents higher in 1945.

R. W. Sherman

Ohio Hog Prices

A study of hog prices has been carried on since 1937. This study shows that over a period of years hog prices between markets vary greatly at times, although they average about the same from year to year. Ohio hog prices from 1940 through 1946 averaged about the same as the prices for hogs in Indiana.

Within Ohio, prices over the state have gradually narrowed so that there is very little difference, on the average, for prices of hogs paid in one section of the state compared to prices paid in other sections. This narrowing of prices has approximated close to 50 cents from 1925 to 1945. For the 5-year average from 1937 to 1941 it made little difference whether hogs were sold on Monday or Friday or some other day of the week. The middle of the week, Tuesday, Wednesday, or Thursday, averaged from 2 to 3 cents lower than the beginning and the end of the week.

Geo. F. Henning

Monthly Variations in Sales of Ohio Farm Products

A study of the seasonal receipts from the sales of farm products in Ohio in recent years reveals that the lowest volume of sales is found in February. During the three years 1944, 1945, and 1946 the heaviest marketing of the principal agricultural products occurred during the last half of the year.

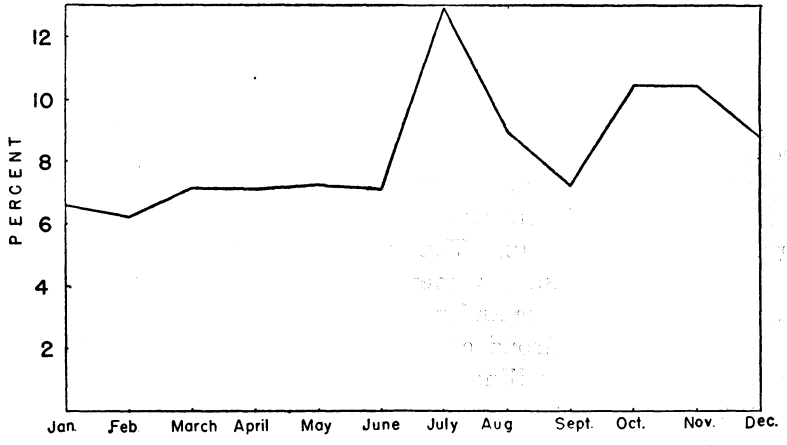

Fig. 2.—Monthly variations in sales of principal agricultural products, Ohio, 1944-1946

Average monthly sales from July through December were 41 percent greater than for the first half of the year. July was the month in which the heaviest farm marketings took place. Over one-eighth of all sales for the year were made during July. This was due in large part to wheat being sold directly from the combine. October and November were also periods of heavy sales because most of the soybeans were sold during these months. Increased seasonal sales of eggs, turkeys, hogs, and cattle also occurred during the last 3 months of the year.

The chart shows the percent of the total annual sales which were made each month.

J. I. Falconer and R. H. Baker

Tare Weights in Marketing Fresh Fruits and Vegetables

Shipping and tare weights were studied in connection with waste losses in the marketing of fresh fruits and vegetables. Observations and scale weights of 27 items were recorded over a 2-month period upon arrival in a wholesale warehouse in Columbus.

Representative sample shipping containers were selected at frequent intervals for examination from conventional commercial shipments.

Composite tare weights (container, cover, liner, packing, ice, and other materials) of the 27 commodities averaged 7.6 percent of the gross weight. Wide variations were noted. Cabbage, citrus fruits, dry onions, and potatoes in bags showed tare weights of less than 1 percent; that is, over 99 pounds of produce were carried by less than 1 pound of package. At the other extreme, shallots in iced barrels required 41 pounds of package and packing materials to move 59 pounds of produce. Twenty-one pounds tare were required to move 79 pounds of head lettuce, 18 pounds tare to move 82 pounds of snap beans, 17 pounds tare to move 83 pounds of bunched carrots, and other items ranged from 10 to 15 percent tare.

The data indicate opportunities exist to reduce excess shipping weights of some products. This may call for closer trimming at shipping points and improvement in shipping containers. Other changes needed are more and improved precooling and refrigeration equipment, better railroad cars and motor trucks, faster delivery schedules, gentler handling at all points, and possibly chemical treatments for preservation.

Progress in this direction should result ultimately in lowered distribution costs.

C. W. Hauck

Butterfat Sampling and Testing Varies

A study of the programs and procedures practiced in sampling and testing for butterfat in seven of the fluid and one of the manufacturing milk markets in Ohio showed an extreme lack of uniformity.

If testing and sampling were standardized, their cost could be reduced, in many instances. It must be remembered that the cash outlay for sampling and testing may not be the total cost, for inadequate sampling and testing, resulting in loss of butterfat to producer or dealer, may add to the cost.

It was hoped that data would be available to the extent that analysis might be made of the cost of sampling and testing. Lack of records in some cases and inadequate accounting in others made it impossible to make a valid analysis of the cost of sampling and testing. In order to make an analysis, aimed at improving the programs, adequate accounting procedures and records are necessary.

D. M. Swartz and C. G. McBride

Costs of Producing Milk in Ohio

In the summer of 1946, a study was made of the costs of producing milk in the principal market milk sheds of Ohio. Carefully selected samples of blocks of dairy farms were chosen to represent the dairy industry of the state. All of the costs incurred in maintaining the herd and producing milk were collected by a survey for the period August 1945 through July 1946 on 227 farms.

Average cost of producing milk in Ohio, 1945-1946

Item	Per cow	Per cwt. of 4% milk	Percent of total cost
Concentrates	$ 82.14	$1.24	30
Dry forage	38.30	.58	14
Succulents	14.40	.22	5
Pasture	16.16	.24	6
Total feed	**$151.00**	**$2.28**	**55**
Labor	76.88	1.16	28
Bedding	10.46	.16	4
Interest	9.28	.14	4
Use of buildings	8.04	.12	3
Use of equipment	3.53	.06	1
Grinding	2.77	.04	1
Miscellaneous	10.78	.16	4
Total cost	**$272.74**	**$4.12**	**100**

On these farms the cost of producing milk for the 12-month period was found to be $4.12 per 100 pounds of 4 percent milk at the farm. Some herds had costs of over $6.00 per hundredweight while others were under $3.00 per hundredweight. On two-thirds of the farms the costs were found to range between $3.25 and $5.50.

The average size of herd studied was between 14 and 15 cows. The average production of the 227 herds was 6,616 pounds of 4 percent milk per cow per year.

Three-fourths of the farms used mechanical milkers. Their costs were found to be $3.95 per 100 pounds of 4 percent milk or about $1.00 per hundredweight less than on the farms milking by hand. The herds where the cows were milked by hand were somewhat smaller having only 10 cows as compared to 16 cows in the herds where mechanical milkers were used.

Feed, at the prices prevailing during the period of the study, made up 55 percent of the total cost of milk production. The average feed consumed per 100 pounds of milk produced was 53 pounds of concentrates, 66 pounds of hay, 66 pounds of silage, and 3 days of pasture.

The labor used in producing the milk amounted to 28 percent of the cost. The time spent was 1.93 hours per 100 pounds of milk produced or 128 hours per year per cow.

R. H. Baker and J. I. Falconer

Farm Real Estate Prices Climb

An economy stimulated by war has again influenced farm real estate prices, mortgage debt, and the tenure status of many farm operators. Eventually, major readjustments to a peacetime economy may be necessary, but when and to what extent remain indefinite. Since 1941, the farm real estate situation in Ohio has been under constant study in order to keep abreast of developments. Following are some of these developments from 1941 to June 1947 which may have significance:

1. Average farm real estate prices in Ohio reached practically the same level in the spring of 1947 as in the spring of 1920.
2. This price advance did not apply equally to all land. Land influenced by urban surroundings tended to rise higher than land away from such influence.
3. Analysis of individual sales showed that land classed as having average or lower productivity had increased in price relatively more than land above average, land with fair or good buildings had advanced relatively more in price than land with poor buildings (particularly since 1944), smaller tracts of land had advanced in price relatively more than large farms since 1944.
4. During 1941-1946, nearly 50 percent of all farms were purchased free of mortgage debt. Mortgage-financed purchases averaged higher in price than all-cash purchases, the margin of difference being 4 percent in 1941 and broadening to 15 percent or more in 1944 to 1946. The average equity of buyers of mortgaged tracts was sustained at about 40 percent of the purchase price throughout the period.
5. Local sources of credit—banks, individual lenders, and savings and loan institutions—accounted for more than 90 percent of the new mortgage loans on farms purchased in 1945-1946. Loan policy was therefore in most cases determined on a local basis.
6. Nearly three-fourths of these new loans carried some plan for installment payments, one-half of all being fully amortized.
7. Study of 394 mortgages given during the year ending March 31, 1947, revealed that more than two-fifths would mature in 5 years or less which might require a considerable amount of refinancing.

8. Classification of purchasers indicated a net movement of land into the ownership of persons who intended to operate it personally. This movement was associated with a decline in farm tenancy to the lowest level in 60 years.

H. R. Moore and R. C. Headington

Rural Health and Social Adjustment

Miami County, Ohio, has served as an area for a study of mental health and social adjustment. This study is being carried on in cooperation with the Division of Mental Hygiene in the Ohio State Department of Public Welfare. It is hoped to find factual bases for the development of practical programs in the treatment and prevention of mental and personality disorders and for the improvement of health.

A major effort has been devoted to a special study of about 1,200 farm, village, and small city children in the elementary school grades. The mental health status of these children was analyzed in terms of personality tests, measurements, and ratings. The study resulted in the following conclusions:

1) Based on the criteria adopted, about 13 percent of all farm children showed evidences of superior mental health. Around 16 percent showed decided evidences of poor mental health, while 71 percent ranked between these extremes.
2) Compared to the small city, farm and village homes provided relatively favorable environments for the personality adjustment of children.
3) The average level of mental health, as defined, was significantly higher for girls than for boys. For instance, about twice as many farm girls as farm boys were exceptionally well adjusted.
4) Failure or a series of failures in school were found to be major mental health hazards to children. It was found, for example, that fully one-half of all seriously retarded children were poorly adjusted.

As a result of this and various other lines of research local groups in Miami County have developed active programs of mental health education and services. A major accomplishment has been the development of plans for the establishment of a fully staffed guidance center for remedial and preventive treatment and for the promotion of mental and social health.

A. R. Mangus

Dairying

Supplements in Calf Feeds

Distillers' solubles and fish solubles were added separately and in combination to the milk fed to calves during the first month and to calf starters used in a dry feed system of feeding. These supplements were used primarily as sources of B-complex vitamins.

No improvement in performance and in health history of 30 Holstein and Jersey calves of both sexes over controls raised according to a standard dry feed system was observed. The supplements were palatable, however, in amounts up to 4 percent of the calf starter for fish solubles, and 12 percent for distillers' solubles. Performance of the calves receiving the supplements was considered satisfactory (fig. 3).

W. E. Krauss, C. F. Monroe, J. W. Hibbs, and W. D. Pounden

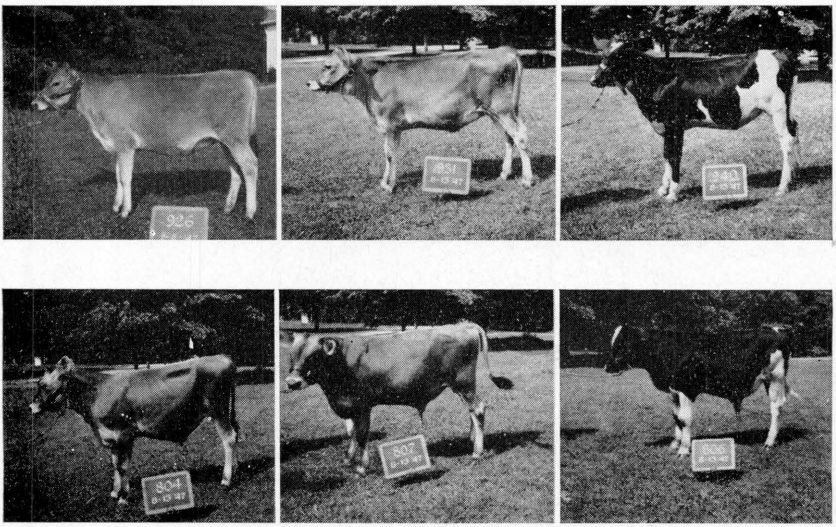

Fig. 3.—Condition and weight of calves at 6 months of age when raised on a limited amount of milk and various dry feed combinations

926—Jersey female control, 240 lb.
804—Jersey male control, 334 lb.
931—Jersey female. Distillers' solubles and fish solubles added to milk, 292 lb.
807—Jersey male. Four percent distillers' solubles added to basal ration, 375 lb.
940—Holstein female. Twelve percent distillers' solubles added to basal ration, 420 lb.
806—Holstein male. Fish solubles added to milk, 513 lb.

Management Important in Controlling Diarrhea in Calves

Diarrhea in calves of 1 to 3 weeks of age is prevalent in many herds. In an attempt to develop preventive measures, the problem was investigated in three herds containing 140 calves, 74 of which suffered attacks of diarrhea.

Two factors stood out as being important in stimulating the onset of attacks. One of these was the sudden dropping of temperatures during winter and spring which resulted in the chilling of many calves of susceptible age. When temperatures suddenly dropped to freezing or below there was an average of eight occasions in the three herds when cases of diarrhea occurred as opposed to five instances when no cases were present among the calves under 21 days of age. There was but one time per herd when diarrhea cases were present in similar-aged calves during a period when comparatively warmer weather prevailed.

Changes in management routine was a second factor that apparently was of significance in the onset of attacks of diarrhea. This was indicated by the observation that 41 of the attacks were first noticed on Mondays and Tuesdays along with the 2 days following Christmas as opposed to 33 cases which were first discovered on the remaining 5 days of the week combined. The changes in schedules that occurred on weekends and holidays apparently stimulated the onset of attacks which showed up during the next couple of days.

It was evident from the data that these two factors did not cover all the causes of diarrhea involved in these herds. Other research work indicates that faulty development of rumen digestion during its earlier stages may be one of the factors involved in this problem.

W. D. Pounden, J. W. Hibbs, and W. E. Krauss

Roughage Quality May Be Related to Mastitis

There is a possibility that the common varieties of streptococci associated with mastitis produce some of the damage to udders by changing the milk as they grow in it and causing it to become irritating to the gland. A logical follow-up is a search for factors, associated with the feed or environment of cows, which influence the suitability of milk as food for the growth of *Str. agalactiae*. The inference is that these factors would thereby influence the course of the disease.

As was expected, difficulties were experienced in eliminating many variable factors that exist both in the barn and in the laboratory. At the time of making this progress report it is reasonably

safe to conclude from the results obtained in a limited number of herds that the better roughage generally was associated with the production of milk which was the least suitable to changing by *Str. agalactiae.*

W. D. Pounden and B. H. Edgington

Vitamin D and Thyroprotein for Milk Fever

Previous work had shown that the feeding of large amounts of vitamin D (1 to 5 million units daily for from 2 to 4 weeks pre-partum) to dairy cows is not effective in controlling milk fever. It is possible that these large doses fed for too long a period might suppress the cow's own parathyroid activity. It was decided, therefore, to try feeding 10 million units of vitamin D daily for from 5 to 7 days pre-partum to cows with previous milk fever histories. Blood serum calcium and phosphorus were determined before and after parturition and the urine was checked for calcium and acetone bodies.

Three cows with previous milk fever histories which were fed vitamin D in large doses for this short period of time did not develop milk fever nor did they show the drop in serum calcium and phosphorus to the extent usually seen in control cows or in cows fed vitamin D for longer or shorter periods of time. Further work will be necessary to test adequately the value of this system of controlling milk fever.

A few cows also were fed thyroprotein (20 grams daily for 2 weeks) before parturition and its effect on serum calcium and phosphorus at parturition was studied. Thyroprotein apparently had no marked effect on the serum calcium and phosphorus at parturition.

J. W. Hibbs, W. E. Krauss, and W. D. Pounden

Thyroprotein Feeding Affects Blood Cholesterol and Blood Sugar

The need for a simple laboratory test for determining the increases and decreases in metabolic rate of cattle which are being treated with substances such as thyroprotein and thiouracil is becoming increasingly evident. Since the blood cholesterol level is used as an important index of the metabolic rate in human medicine, it seemed desirable to investigate its possibilities as an index of the metabolic rate in thyroprotein- and thiouracil-fed cattle.

Frequent blood plasma cholesterol determinations following the initiation of thyroprotein feeding (15 gms. daily) to Jersey cows revealed a decrease of about 20 percent within 2 weeks.

After thyroprotein feeding was terminated, the plasma cholesterol increased to above the normal level. This is evidence that cows are in a hypothyroid state after terminating thyroprotein feeding.

Results to date indicate that plasma cholesterol can be used as an index of the metabolic rate changes in cattle fed thyroprotein provided the individual's normal level is determined before thyroprotein feeding is begun.

Little, if any, effect on blood sugar was noted in thyroprotein-fed non-parturient cows.

In normal cows at parturition, the serum cholesterol was found to decrease about 20 percent. An additional 20 percent decrease (40 percent total decrease) in serum cholesterol was observed at parturition when thyroprotein was fed (15 gms. daily for 2 weeks before freshening).

The blood sugar increased to above normal values just before parturition in both thyroprotein- and non-thyroprotein-fed cows. This was followed by a rapid decline to subnormal levels within 2 days after freshening. Within a few days the blood sugar level returned to normal.

J. W. Hibbs and W. E. Krauss

The Incidence of Infertility in Dairy Cows

An investigation conducted in cooperation with the Northern Ohio Breeders' Association was made of the incidence of infertility among the dairy cows belonging to members of the Association in one representative county during the period of a year.

A total of 178 cows and heifers were classified as having inadequate breeding histories. The group included cows that had visible pathological conditions, those that failed to come in heat or came in heat in a very irregular manner, and cows that required in excess of three services for conception. Based on the total of 1,347 animals which were bred at least once during the year this represents 13.2 percent of the total. These 178 animals were confined to 94 of the 255 herds which were visited.

A breed difference as regards the incidence of faulty breeding among the cows was noticeable for the three breeds that were represented in appreciable numbers. The percentage figures for faulty breeders were: Guernsey 18.5 percent (627 cows); Holstein 8.9 percent (578 cows); and Jersey 2.6 percent (117 cows). The services per cow also reflected this situation to some extent even though the two sets of data are not exactly comparable. The services required per cow were as follows: for Guernseys 1.88, Holsteins 1.51, and Jerseys 1.53.

E. Zoerb, W. D. Pounden, and W. E. Krauss

Storage of Spermatozoa

Amino acids, sugars, sulfa drugs, and fertile versus infertile eggs have been studied in dairy bull semen preservation.

Each of the amino acids studied,except tryptophane, maintained a high rate of motility-activity of the sperm cells for a period of 14 days in storage when added to diluted semen. The sugars used were of no added value in keeping sperm cells living when compared with amino acid-buffered egg-yolk diluent.

Sulfanilamide retarded bacterial growth and slightly improved the storage of processed semen but did not kill all bacteria.

No difference was found between the value of fertile and infertile eggs in semen dilution.

C. E. Knoop

Legume Mixtures Make Milk Economically

During the pasture season of 1946 two groups of seven and eight Jersey cows each were alternated between supplemental and no supplemental hay feeding while grazing legume meadow mixtures. In three of the four periods involved, the cows showed relatively little desire for hay, the average daily consumption ranging from 0.4 to 1.8 pounds per cow.

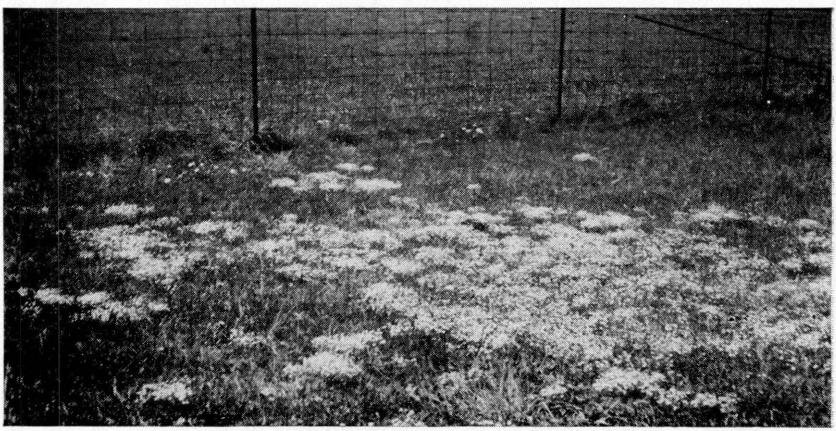

Fig. 4.—Bluets of the untreated permanent pasture make poor grazing in comparison to the bromegrass-ladino-alfalfa meadow beyond the fence.

During the fourth period, when the grazing was less abundant, the daily intake of hay amounted to 3.6 pounds per cow. The grain consumption was likewise low, averaging from 1.5 to 3.7 pounds daily per cow. It seemed evident that the pastures were keeping

the cows fairly well satisfied. The extra hay eaten showed no effect on milk production. The average daily production of 4 percent milk when hay was fed was 28.9 pounds and when hay was withheld it was 28.7 pounds.

A third group of seven Jerseys was pastured on legume meadow mixtures continuously for the grazing period of 119 days. No additional hay and only 1 pound of grain was fed daily to the cows in this group. Thus, these cows were forced to obtain practically all of their feed from the pastures. The better producers and the older cows of known producing ability were selected for this group. The results obtained with these seven cows were similar to those obtained with the other two groups in showing the milk producing ability of the meadow pastures without supplementary hay. The group averaged 32.0 pounds of 4 percent milk daily per cow, with the four top cows averaging 37.4 pounds.

An adequate acreage of the meadow crop mixtures was available for this work. Thus, the cows had ample grazing with the possible exception of the last 2 weeks, when a late summer drought had slowed up the plant growth. Four different seedings were grazed. In two of these the mixture was alfalfa, bromegrass, and ladino clover; in one alfalfa, timothy, and ladino clover; and in the fourth, orchard grass, ladino clover, and some alfalfa. The latter was pastured for the last 2 weeks only. In all cases there was a combination of legumes and nonlegumes, which is considered desirable for dairy pastures.

C. F. Monroe and L. E. Thatcher

Temperature of Udder Wash Water Does Not Affect Milk Let-down

Factors involved in stimulating milk let-down in machine milking of cows has been under investigation with eight hard (slow) and six easy (fast) milking cows. The effect of the temperature of udder wash water on rate of let-down was studied by using water at 50° and 64° F., 100° F., and 132° F.

This work revealed that, in the cows used, temperature of udder wash water was not a factor in stimulating fast milking. This suggests that cows milk slowly or rapidly, depending upon the structure of the teats.

Regularity and manipulation of the udder and teats, or any other stimuli applied at a definite interval before the milking operation begins, are definite factors in milk let-down. Warm water aids in cleaning the udders and teats and is more comfortable to use than either cold or hot water.

C. E. Knoop and W. E. Krauss

Livestock

Systems of Feeding Lambs

A series of tests designed to determine what results follow various attempts to make greater use of roughage (clover hay) to corn in fattening lamb rations was begun during the 1946-1947 winter feeding season. A double-deck carload of 54-pound white-faced Montana feeder lambs was divided into eight comparable lots. Clover hay was fed to the lambs in all lots according to appetite. Corn was fed as follows:

Lot 1—Full-fed shelled corn.

Lot 2—Limited to *1 pound* of corn daily per lamb.

Lot 3—No corn first month, limited corn second, third, and fourth months, and full-fed corn to finish for late spring market.

Lot 4—A gradual increase in corn allowance by ¼ pound daily per lamb each month after end of the first month, when lambs were at ½ pound daily per head.

Lots 5, 6, 7, and 8 duplicated lots 1, 2, 3, and 4, respectively, except that 0.15 pound of corn daily per lamb in each lot was replaced by an equal weight of soybean oil meal.

The results of this first test are available. Lambs full-fed corn (lots 1 and 5) made the most rapid and most economical gain, used the most corn and the least hay in making each 100 pounds of gain, reached market finish and weight quickest, and were ready for market considerably in advance of all other lots. The replacement of 0.15 pound of corn with an equal weight of soybean oil meal had no significant effect when good quality clover hay was used.

The lambs limited to 1 pound of corn per lamb per day for the feeding period did not command top market price, even after being on grain feed for 175 days. In addition, these lambs made the slowest gain, using the most total feed, and showed the highest cost per 100 pounds of gain. The substitution of supplement for corn increased the rate of gain just sufficient to pay for the protein fed in the exchange. The saving of $1.53 worth of corn (30.6 pounds) was at the expense of $2.96 worth of hay (197.4 pounds) and these limited-fed lambs were not regarded as finished.

Delayed feeding of corn (lots 3 and 7) to make near maximum use of the hay, and to gain any benefit a higher springtime market might afford, resulted in well-finished lambs that had made satisfactory gain but there was no saving effected in cost. Actually, 47.3 pounds of corn were saved at the expense of 156.6 pounds of hay in producing each 100 pounds of gain, which, at the same

prices as used above, was an equal exchange except for the extra weeks of labor and risk. When 0.15 pound of protein supplement replaced an equal quantity of corn, under this delayed system of feeding there was a saving of $1.31 in producing each 100 pounds of gain on the lambs.

The system of feeding whereunder the allowance of corn was increased as the condition of the lambs improved approached most nearly the results obtained under full feeding, with only minor saving of corn.

There was no unusual incidence of death loss in any lot in this test. Five lambs died, but these were distributed as one lamb in each of five different lots.

D. S. Bell and B. H. Edgington

Soybean Oil Meal for Pigs in Dry Lot

As evidenced by the removal of 16 percent of the pigs from the experiments because of unthriftiness and by the failure of some of the others to develop normally, a basal ration of yellow corn, soybean oil meal, ground alfalfa, minerals, and one-hundredth of a percent of irradiated yeast was deficient in one or more respects for use under dry lot conditions. The alfalfa constituted approximately 5 percent of the ration.

When water was added and yeast was grown in the wet feed for 24 hours, the removals dropped to less than 4 percent. The pigs not only remained healthier but also developed normally, required 8.9 percent less feed per unit of gain, grew more rapidly, and were ready for market 16 days earlier than those on the dry basal ration.

There were other effective methods of improving the above-mentioned basal ration for dry lot feeding:

Pigs having condensed fish solubles at the average rate of 15 percent of the supplement, 3.6 percent of the total feed, or 1 pound to each 5 of soybean oil meal showed no deficiency symptoms, required 4.4 percent less feed per unit of gain, gained more rapidly, and were ready for market 24 days earlier than those having the basal ration.

Dried distillers' solubles, fed at the rate of 20 percent of the supplement or approximately 6 percent of the total feed, lowered the feed required per unit of gain 4.7 percent and resulted in sufficiently faster gains to enable the pigs to be marketed 20 days earlier than those on the basal ration.

Meat scraps, or an animal protein concentrate, used in place of half of the soybean oil meal was likewise effective in improving the ration of yellow corn, soybean oil meal, ground alfalfa, minerals, and irradiated yeast for dry lot feeding. The pigs developed normally, remained healthier, required 3 percent less feed per unit of gain, gained more rapidly, and were ready for market 25 days earlier than those on the ration otherwise composed of the same feeds.

W. L. Robison

Methods of Feeding Pigs on Pasture

In an experiment with five groups of 20 pigs each on alfalfa and red clover pasture, those having the supplement in one compartment and shelled corn in the other compartments of a self feeder gained at approximately the same rate and required approximately the same amount of feed per unit of gain as those having a full feed of ear corn twice daily plus 0.6 pound of supplement daily a head, in two feeds.

On the basis of 100 pounds, the supplement consisted of 60 percent protein meat scraps, 30; 44 percent protein soybean oil meal, 60; and minerals, 10.

Pelleting the supplement and self-feeding a mixture of it and shelled corn resulted in faster gains and an 8 days' earlier marketing time but in no greater gains per unit of feed consumed than self-feeding shelled corn and the non-pelleted supplement separately. Apparently pelleting and mixing the supplement with shelled corn will not force pigs to eat any more of the supplement than they care for. During the early part of the experiment, when the pasture was exceptionally good and when a relatively high percentage of supplement was fed, the pigs picked out and ate the shelled corn but, after crunching the pellets, left some of the supplement in the trough of the feeder.

Pigs full-fed a mixed ration of ground shelled corn and supplement twice a day ate more feed daily a head, gained faster, were ready for market 11 days earlier, and required 1.8 percent less feed per unit of gain than the pigs full-fed ear corn and a given amount of supplement twice a day.

Pigs self-fed a mixed ration of ground shelled corn and supplement ate still more feed and made still faster gains. They were ready for market 8 days earlier. On the other hand, they required 4.3 percent more feed per unit of gain than those that were full-fed the same ration twice a day.

W. L. Robison

Baby Pig Losses

Unusually heavy losses in recently-farrowed pigs occurred in many herds during the spring of 1947. The losses were most common in pigs during the first to third week after farrowing.

The symptoms were those of a severe gastro-enteritis manifested by vomiting, severe diarrhea, rapid loss in weight, with death in from 1 to 4 days. Occasionally the sow would vomit, show diarrhea, and have a diminished milk flow. The condition was seldom fatal in the older animals. Recovery generally took place in 7 to 10 days.

The condition was experimentally reproduced in young normal pigs 4 to 7 days of age by feeding them a small amount of the gastro-intestinal contents of pigs dead of the disease.

Additional work is being conducted in an attempt to determine the definite cause of the disturbance.

B. H. Edgington, W. R. Krill, Wise Burroughs, J. H. Helwig, and Norma A. Frank

Vitamin Deficiency Produces Scours in Pigs

Pigs kept indoors and fed rations deficient in the vitamin niacin developed scours after a feeding period of 1 month. The pigs at this time weighed between 40 and 50 pounds and growth was extremely poor. The degree of scours varied, with some pigs becoming quite emaciated; however, the mortality rate was not high.

Similar pigs fed the same ration but receiving niacin supplements gained satisfactorily and exhibited no diarrhea.

The practical significance of this vitamin deficiency playing a part in necrotic enteritis is not known and is under investigation. Diarrhea, scours, or enteritis of one sort or another are encountered in pigs of all ages on Ohio farms. Some of these conditions appear infectious in nature while others may not be caused by an infectious agent.

Wise Burroughs, B. H. Edgington, W. L. Robison, and R. M. Bethke

Roughage Utilization in Beef Cattle Rations

The degree to which cattle utilize their roughage depends not only upon the nutrient make-up of the roughage itself but also upon the type of concentrates fed along with the roughage.

Digestion experiments with steers were conducted while feeding various concentrate feeds along with one of the following roughages: alfalfa hay, corn cobs, or timothy hay. The addition

of protein feeds to each of these roughages failed to influence roughage utilization when no grain was being fed. However, when grain ingredients were fed, roughage utilization increased rather markedly with protein additions in the case of timothy hay and corn cobs and to a slight extent with some alfalfa hays.

Tentatively it appears that other nutrients, in addition to protein, may also be influential in the utilization of roughages by cattle.

Wise Burroughs and Paul Gerlaugh

Soybean Oil Meal May Affect Cob Utilization

Earlier experiments in which ground shelled corn, regular corn-and-cob meal, and corn and added cob meal were compared for fattening steers indicated that when 2 pounds of soybean oil meal was fed daily per steer the cobs had a replacement value of half their weight of shelled corn.

During the past 2 years, tests were conducted with yearling steers comparing corn and added cob meal with ground shelled corn with different amounts of soybean oil meal being added to the various lots. Three lots of the steers were fed corn and added cob meal. The amount of cobs added to a ton of ear corn were the same as obtained from a ton of similar ear corn when shelled. One lot of steers, 20 per lot, received no soybean oil meal, one lot received 1 pound of soybean oil meal per steer per day, and the third lot received 2 pounds of soybean oil meal per steer per day. Two lots of steers received ground shelled corn. One of these lots received no soybean oil meal, while the second lot received 1 pound of soybean oil meal per steer per day.

All five lots received what mixed hay they wanted, though there was very little difference in their hay consumption. Minerals and salt were available to all lots.

The cattle receiving the soybean oil meal gained more rapidly than the cattle receiving no soybean oil meal. The replacement values of the cobs were higher when soybean oil meal was fed.

Paul Gerlaugh, Wise Burroughs, and L. E. Kunkle

Listerellosis Found in Ohio Farm Animals

A disease of farm animals and occasionally of humans which is generally characterized by brain disturbances had been seen to a limited extent in farm animals in a few states prior to diagnoses in Ohio in 1942 in a flock of sheep.

During the past year, an unusual outbreak was encountered in a herd of young beef animals.

Out of 27 calves of 3 to 4 months of age in the herd, 8 died. The first noticeable sign of sickness in these calves was a slight dullness. Within an hour or so, they would bellow as though in severe pain, turn around, fall to the ground, go into convulsions, and die within a few minutes. It was not until causative organisms, which go by the name of *Listerella monocytogenes*, were obtained from the brain of one of the dead calves that a definite diagnosis was made.

W. D. Pounden, B. H. Edgington, D. S. Bell, and Paul Gerlaugh

Poultry

Hydrated Lime Lengthens Floor Litter Life

Five different broods of chicks have been successfully raised on the same floor litter that has been in almost continuous use for 18 months (since May, 1946). There was little or no indication of coccidiosis or any ill effects of using the built-up litter with hydrated lime for one brood of chicks after another.

Most remarkable, however, were the results of the experiment in which 600 day-old chicks were brooded and raised in a laying house on built-up floor litter that had been previously used nearly 2 years by hens, with only a 2-week interval between removal of the hens and the starting of the day-old chicks. That these chicks fared as well as adjoining groups, which were started on fresh wood shavings built-up litter, was quite unexpected.

During the past year, 775 of the Station's layers have been on the previous year's floor litter, started in October, 1945, with no ill effects or disadvantages to be attributed to the long-continued use of the litter.

Obviously, there was a material saving in labor and litter material in both the brooder and laying houses. The use of hydrated lime was an important aid in accomplishing these results.

D. C. Kennard and V. D. Chamberlin

Floor Litter Management Affects Hatchability

The fourth experiment with reference to the minimum requirements of meat, fish, and milk by-products for the production of hatchable eggs was completed this year. In this year's experiment, the floor litter (a previously unrecognized factor of great importance) became the primary consideration.

Four rations (including the basal ration) and three different litter procedures were employed. The basal ration (composed of ground corn, ground oats, wheat bran and middlings, soybean oil meal, alfalfa meal, bonemeal, oyster shell, iodized salt, manganese, and vitamin A and D feeding oil) was supplemented by: (1) 2.5 percent dried whey; (2) 2.5 percent dried whey and 2 percent meat scraps; and (3) 2.5 percent dried whey and 4 percent meat scraps.

Each group of layers that received the four different rations was subjected to the three different floor litter procedures: (1) built-up wood shavings floor litter with hydrated lime, started with beginning of the experiment; (2) old built-up floor litter with hydrated lime used by hens of the previous year's experiment; and (3) floor litter (without lime) removed and renewed with fresh wood shavings each 2 weeks.

The results of this year's experiment definitely substantiate the contention that built-up floor litter serves as a source of the nutritive factors essential for the production of eggs of good hatchability. There was a good percentage of hatchability of eggs from all of the pens, regardless of the rations, in which there was built-up floor litter; whereas, there was very poor hatchability of eggs from the basal ration where the layers were on floor litter removed and renewed each 2 weeks.

Somewhat better but still poor hatchability was secured from the layers which received the basal ration with 2.5 percent dried whey. It was only when the basal ration was supplemented by 2.5 percent dried whey and 2 or 4 percent meat scraps that eggs of good hatchability were secured from the layers in the fresh litter pens.

D. C. Kennard, R. M. Bethke, and V. D. Chamberlin

Built-up Floor Litter as a Source of Nutritive Factors

Upon the discovery that built-up floor litter was a valuable source of nutritive factors essential in the production of hatchable eggs, it was logical to suspect that it might also be a probable source of the essential nutritive factors for the growth of chickens. Consequently, experiments to this effect were started.

The first experiment was conducted with four groups, each of 200 day-old chicks, which were brooded and raised on built-up wood shavings litter and hydrated lime which had previously been used for four preceding broods of chicks.

Two of the groups of chicks were started and grown on a complete ration adequate in the essentials for the growth of chickens indoors. The other two groups of chicks were started and grown on the incomplete ration composed only of corn, oats, wheat bran and middlings, soybean oil meal, bonemeal, oyster shell, iodized salt, manganese, and vitamin A and D feeding oil. At the end of 12 weeks, the average weight of the chickens which received the complete ration was 2.57 pounds and that of those which received the incomplete ration was 2.17 pounds. The loss of chicks from all of the groups was negligible with an average of 5 percent at the end of 12 weeks.

The second experiment was started with two groups, each of 155 Leghorn by R. I. Red crossbred pullets at the age of 10 weeks. After 12 weeks, when the pullets were 22 weeks of age and had started to lay, the average weight of the pullets which received the complete ration was 3.84 pounds, and that of the group which received the incomplete ration was 3.73 pounds. The flock reduction due to loss of birds and culls was practically the same for both groups.

It appears from these two experiments that built-up floor litter and hydrated lime largely supplemented the deficiencies of the incomplete ration with the nutritive factors necessary for the growth of chickens indoors.

D. C. Kennard and V. D. Chamberlin

Ration of Breeders Affects Growth of Progeny

Studies with chicks showed that the ration of the breeders influenced the early growth of chicks. Growth on a yellow corn-soybean oil meal ration was significantly greater in chicks from hens on a soybean oil meal-fish products ration than in chicks from hens on an unsupplemented soybean oil meal ration.

These observations show that the unidentified factor (s) in certain animal protein supplements is transmitted from the hen through the egg to the chick—like many of the vitamins—and point out the importance of adequate breeder rations in the production of good vigorous chicks.

R. M. Bethke, J. M. Pensack, D. C. Kennard, and V. D. Chamberlin

Farm Engineering

Drying Hay by Forced Ventilation

Tests on the use of forced ventilation show that it can be used for conditioning loose, chopped, and baled hay. Based on these tests, the following recommendations are given for drying hay in fan-ventilated storages.

Fig. 5.—Baled hay should be cross-stacked to prevent free passage of air between the bales

The mow floor should be airtight —block off paths for air leakage around posts, hay chutes, and stair wells. Make the main air tunnel large enough to keep air velocities less than 1,000 feet per minute. Low velocities give better air distribution and less friction loss.

Either ducts or a slatted floor may be used to distribute the air from the tunnel under the hay, provided the system used is designed to give low air velocities and adequate space for the air to enter the hay. Provide plenty of openings above the hay to allow the wet air leaving the hay to escape from the mow.

The rate of drying is directly proportional to the amount of air forced through the hay. The fan should provide at least 15 cubic feet of air per square foot of floor area for loose hay and 25 cubic feet of air per square foot of floor area for chopped and baled hay.

Better air distribution is secured through hay chopped 4 to 5 inches long, than through finely-chopped hay. The fine hay tends to form pockets which exclude the air and give uneven drying. When the hay is put in the mow distribute it evenly over the entire

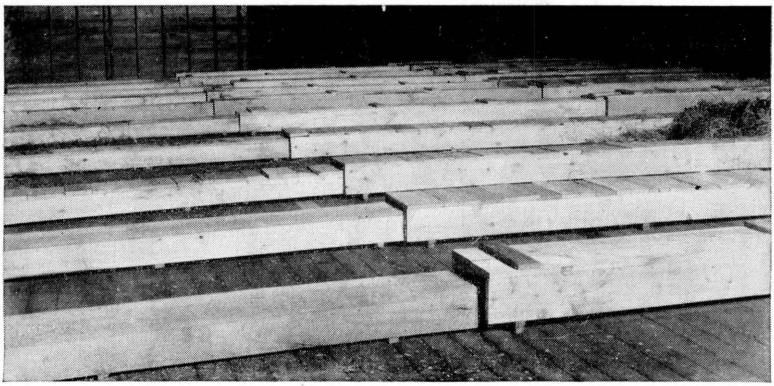

Fig. 6.—Duct system on a large mow floor. The ducts may be made smaller outward from the main tunnel

system. A thin layer of hay over a large area is dried more efficiently than the same amount of hay piled deeper over a smaller area.

Efficiency of the system is reduced if the hay is placed on the system higher than one-half the width of the mow. In no case should long hay be placed deeper than 12 feet at one cutting nor chopped and baled hay deeper than 9 feet.

The fan should be run continuously until the top layers of the hay are dry.

J. D. Blickle, R. C. Miller, and R. L. Erwin

Hourly Costs of Tillage Tools

Tillage practice was studied in relation to soil structures and crop response. The hourly costs of four types of tillage tools used in tests of preparation of sod land for corn as determined by these studies is shown graphically in figure 7. Machinery prices used are as of May 1947.

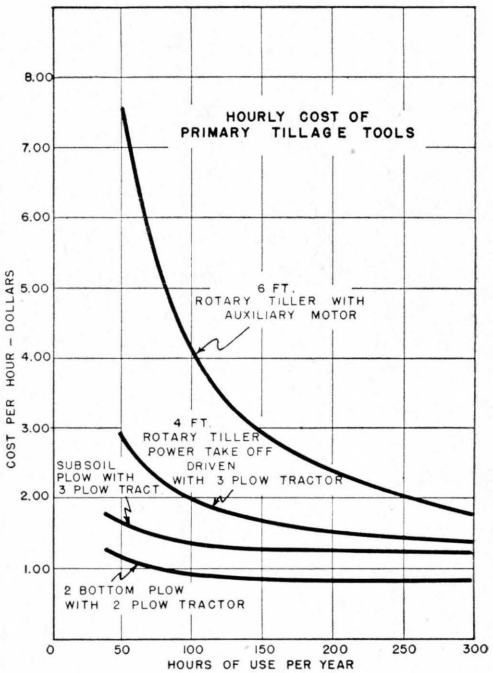

Fig. 7

R. L. Erwin

Soil Management

Erosion Control an Essential Part of Sound Soil Management

Erosion has long been recognized as a major cause of soil depletion and low crop yields on many Ohio farms. During the past decade experiments have been conducted to determine the value of topsoil and to evaluate various agronomic practices for increasing crop yields on subsoil where the productive topsoil has already been lost by erosion. A number of different soil management systems, ranging from highly depleting to strongly soil-building systems, have been compared on virgin topsoil and on raw subsoil on an adjacent area.

In thirty comparisons during a 10-year period, corn yields on topsoil have averaged 75 bushels per acre while on subsoil it has yielded less than 35 bushels per acre. Twelve oat crops have averaged 59 bushels per acre on topsoil but only 25 bushels per acre on subsoil. Topsoil wheat yields have averaged 29 bushels, while subsoil has produced less than 12 bushels of wheat per acre, in eighteen comparisons. Twenty hay crops on topsoil have averaged 2.6 tons per acre, in comparison with slightly less than 2 tons per acre on subsoil. Fertility treatments in each pair of individual comparisons were identical. During the 10-year period, approximately twice as much food and feed crops have been produced on an acre of topsoil as on an acre of subsoil with essentially the same investment of labor, machinery, lime, and fertilizer.

The most effective system of increasing crop yields on raw subsoils has been a 4-year rotation of corn, wheat, and 2 years of alfalfa, receiving lime, fertilizer, and manure at recommended rates of application. Crop yields on both topsoil and subsoil have been closely correlated with the quantity and quality of the sod crops produced in the several soil management systems. The liberal use of sod crops in the rotation reduces the erosion hazard. The regular use of lime, fertilizer, and manure or residues is essential to the production of high quality sod crops. In addition to soil building rotations and fertility amendments, specific conservation practices such as contour cultivation, strip cropping, and terracing are required on sloping fields if valuable topsoil is to be kept at home and the productive capacity of the land is to be maintained.

R. E. Yoder

Fertilizer Most Effective in a Good Crop Rotation

That a unit of phosphate-potash fertilizer can be made to stretch itself in crop production when used in a good rotation is illustrated by two crop rotations in the Fry Farm crop rotation experiments at Wooster. The rotations are a 3-year rotation of corn, wheat, and clover and a 4-year rotation of corn, wheat, and 2 years of alfalfa meadow. These rotations were started in 1935.

Both rotations received the same average annual application of fertilizer. The corn in both rotations received 150 pounds of 0-14-7 per acre in the hill; the wheat in the 3-year rotation, 300 pounds of 0-14-7 and in the 4-year rotation, 450 pounds. This averages 150 pounds per acre per year.

The yields in the 3-year rotation in 1946 were 49.3 bushels of corn and 40.0 bushels of wheat: in the 4-year rotation, 59.5 bushels of corn and 54.2 bushels of wheat. That is to say, each unit of 0-14-7 in the 4-year rotation was 27 percent more efficient in grain production than in the 3-year rotation. This greater efficiency may be attributed to (1) smaller soil erosion losses in the 4-year rotation and (2) larger amounts of nitrogen fixation by the alfalfa and consequently more nitrogen available for crop production when the alfalfa sod was plowed. Along with this more abundant supply of available nitrogen, the alfalfa sod also increases the amount of organic matter in the soil, whereas the single year of clover is not quite good enough to maintain the soil organic matter in that rotation.

The corn and wheat (stover and straw included) in the 3-year rotation took about 140 pounds of nitrogen from the soil: the grain crops in the 4-year rotation required 185 pounds.

L. E. Thatcher and R. E. Yoder

Rate of Release of Potash from Ohio Soils Varies Greatly

The amount of potash given up by Ohio soils for crop growth varies considerably with respect to different kinds of soil. In greenhouse pot experiments where alfalfa was grown continuously on Wooster, Trumbull, Clermont, and Miami soils it was found that the annual rate of release of soil potash was 92, 58, 32, and 24 pounds per acre per year, respectively.

Eight-year average results on Wooster silt loam in a 3-year rotation of corn, wheat, and alfalfa shows that 80 pounds of potash were released annually under normal field conditions. Data obtained from experiments on the outlying farms indicate a variable rate of potash release. Soils and their annual potash release

rates in pounds per acre are: Clermont, 37; Vincent, 64; Mahoning, 71; Muskingum, 42; Brookston, 64; Miami, 45; Volusia, 53.

In view of the fact that Ohio soils exhibit great variability in their potash-supplying powers, it is important that potash-carrying fertilizers be used accordingly. Fertilizers carrying at least 12 percent of this nutrient should be used on the soils that release less than 50 pounds of potash annually. If liberal quantities of good manure are applied to the land the quantity of potash applied in the form of commercial fertilizer can be reduced.

G. W. Volk and R. H. Simon

Sweetclover an Effective Catch Crop for Green Manure

Under a decade of continued pressure for increased production of grain crops, many Ohio farmers have materially increased their acreage of row crops and small grains at the expense of the acreage normally devoted to soil-rejuvenating sod crops. Under this prolonged, unbalanced cropping system many farmers are finding it increasingly difficult to keep their soils in good physical condition and maintain high corn yields. Results of research with sweetclover as a green manuring crop offer a partial solution to this situation.

Long-time fertility experiments at the Experiment Station and its outlying experiment farms, show that seeding sweetclover in wheat or oats as a catch crop for green manure may be expected to increase the following corn crop by 10 to 12 bushels per acre. An additional 5 to 8 bushels of corn is normally obtained if the straw is plowed under with the young sweetclover. In recent experiments at Wooster, sweetclover thus used as a green manure has been equal to at least 80 pounds of chemical nitrogen per acre (equivalent to 400 pounds of sulfate of ammonia).

On level land, corn yields of 70 to 75 bushels per acre have been maintained at Wooster under a 2-year rotation of corn and small grain by using sweetclover as a green manure and leaving the straw and stover on the land. The experiments indicate that in addition to regular liming, this rotation should receive about 500 pounds of 0-20-10 per acre, divided between the corn and small grain crop. This 2-year rotation is suited only to level land.

On gently sloping land the traditional 3-year rotations of corn, small grain, and sod may be stretched to 5-year rotations by adding corn and small grain with sweetclover for green manure. Thus, increased cereal grain production can be obtained at moderately high yield levels without seriously depleting soil resources, if the

land is limed and fertilized regularly. On steeper lands where erosion is the most serious hazard, sweetclover for green manure should not be substituted for sods. On such land, each row crop should be preceded by a good 2-year-old legume-grass sod; in addition, intensive use of erosion control practices will be required to maintain soil productivity.

R. E. Yoder

The Ohio Soil Survey

A basic soil survey is almost completed for Clark County. This survey is being made in cooperation with the Division of Soil Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Soil Conservation Service, U. S. Department of Agriculture.

Farm conservation surveys, made in connection with the program of the Soil Conservation Districts, are in progress. These surveys are being made by the Soil Conservation Surveys Division of the Soil Conservation Service. They are in progress in about 65 Ohio counties, where Soil Conservation Districts have been organized.

Soil survey maps and reports of Tuscarawas and Huron Counties are being prepared. Field work has been completed in these counties.

G. W. Conrey and D. D. Mason

Silage

Fresh, Long Hay Makes Satisfactory Silage in Bales

Fresh green meadow crops taken from the swath and baled, then buried in a trench silo with similar material that was chopped and compacted by tramping, made silage of equivalent color and palatability.

Other bales in airtight wrappings produced good silage after 8 weeks, when left in the open. In all cases where the essential condition (exclusion of air) for the moist preservation of forages existed, silages formed.

The immediate practical applications of ensiling bales will depend upon availability of the necessary equipment, such as trenches or wrapping materials. Since conventional kinds of forage harvesting machinery are still scarce, this exploratory test indicates that new ways of handling forage crops may be possible with machines now on many farms.

W. A. Junnila and Charles F. Rogers

Ensiling Loss Smaller than Previously Believed

Extensive work in which small experimental silos and contents were weighed before and after the silage making period of about 35 days, has shown total weight losses of only 1 or 2 percent. This is in contrast to the prevailing idea that an unavoidable 10 to 15 percent loss occurs, usually ascribed to fermentation. Such loss figures were based on dry matter determinations by means of oven drying, on both crops and silage.

Useful products stable at ordinary temperatures but volatile at oven temperatures are formed during silage making. These are driven off with and counted as water, when dry matter is determined by any form of oven drying procedure.

These results are in keeping with recent work which shows silage making to be considerably more efficient than hay making for preserving the nutrients of hay crops.

A. E. Perkins and R. G. Washburn

Leakage in Silage

Crops ensiled at different degrees of dryness and subjected to pressures representing those found at different levels in large silos have shown that leakage from silage is definitely related to both dryness of crop and pressure.

Crops having below 20 percent dry matter will leak badly even at low pressures. Those of around 25 percent dry matter will leak only at the higher pressures found near the bottom of most silos, while crops of 30 percent or more dry matter will seldom leak in the silo.

When the density of the various silages was studied it was found that leakage began as the silage reached a density of about 0.9 grams per cc. or 56 pounds per cubic foot, and that the residue after extensive leakage often had a density greater than that of water—62.5 pounds per cubic foot.

A. E. Perkins and R. G. Washburn

Compaction or Settling of Silage

The ensiling of crops under sustained pressure over the entire range found in large silos has shown that in spite of the pronounced downward movement of the top surface of the silage, very little compaction occurs in the upper layers.

At 2 pounds per square inch the average compaction was less than 1 percent in 1 day and only 9 percent in 30 days, while at 16 pounds per square inch the compaction was 53 percent in 1 day and 93 percent for the 30-day period.

Rapid compaction and expulsion of air probably account for the better quality of the silage commonly observed at lower levels.

Topping the silo with a heavy wet crop when possible to provide weight and a better seal are definitely indicated.

A. E. Perkins

Corn Silage Equal to Timothy-legume Silage

Three silages were compared in a double reversal feeding trial which consisted of three periods of 35 days each. The silages were fed in six different sequences to a like number of outcome groups, each composed of one Jersey and two Holstein cows. With the exception of the kind of silage fed, all the cows received the same rations and general treatment.

The feed intakes were practically the same on all three of the silage rations. Likewise, the productions showed no significant differences. The average productions of 4 percent milk (F. C. M.) for 28 days were as follows: On corn silage, 777.4 pounds; on corn treated meadow-crop silage, 777.9 pounds; and on corn and acetic acid treated meadow-crop silage, 776.5 pounds.

All the silages were made by a forage crop harvester which cut and chopped the crops in the field. The corn silage was of moderately good quality, made from a grain variety of hybrid corn. Both of the meadow-crop silages were made from the same mixture, consisting of 72 percent timothy, 22 percent clover and alfalfa, and the remainder of weeds and volunteer wheat. To both of these silages approximately 100 pounds of ground corn was added per ton of material blown into the silo. In addition, one of the silages was sprayed with a 12.5 percent solution of acetic acid at the rate of 5 gallons per ton. This small addition of acetic acid, amounting to 0.25 percent, was made in the hope of controlling the original fermentation and thereby improving the quality of the product. The silage resulting from this treatment was of good quality, but only slightly better than the one which received the corn treatment only. Both the meadow-crop and the corn silages contained approximately 28 percent dry matter.

The carotene and vitamin A contents of the milk produced on the three silages showed little difference, although the meadow-crop silages supplied from two to three times as much carotene as the corn silage. This lack of difference may have been due to the length of the feeding periods.

C. F. Monroe, A. E. Perkins, R. G. Washburn, C. E. Knoop, and R. C. Thomas

Farm Crops

Butler Wheat Released

A new wheat variety is being released to Ohio farmers in 1947. The strain is a selection from the cross OSU 101-3 (Portage-Fulcaster) by Trumbull. It is a bearded, white-chaffed, stiff-strawed, red-grained wheat. It has good resistance to loose smut, and is as little affected by scab as any soft winter wheat. It should be particularly useful where low weight per bushel, aggravated by scab, makes Thorne undesirable.

Over a 7-year period, in a total of 76 tests, Butler has yielded 0.9 bushels per acre more than Thorne and 5.0 bushels more than Trumbull. It is thus superior to Thorne in yield, equal to that variety in stiffness of straw, and at least equal to Trumbull in weight per bushel and in reaction to scab. It is hoped it will be especially useful in southwestern Ohio.

C. A. Lamb

Lead Arsenate Controls Grubs Over Long Periods

Both *Phyllophaga* and *Cyclocephala* grubs were relatively unimportant in 1946 over the eastern Ohio area where damage commonly occurs. However, unfertilized bluegrass pastures at Wooster continued to carry higher grub populations than did the fertilized bluegrass pastures or the rotated pastures.

The plots treated with different levels of lead arsenate in 1935 continued to show effective results in 1946. The level of 5 pounds per 1,000 square feet gave a 37 percent reduction in grub population as compared with the check, the 10-pound level 52 percent, the 20-pound level 75 percent, and the 30-pound level 95 percent. Although the reduction in the number of grubs from the 5-, 10-, and 20-pound levels is not as great as during the first few years after treating, the decrease in effectiveness is thought to be due to the continuous mixing of the soil from the 11 years of sampling rather than from a decrease in the effectiveness of the lead arsenate. Chemical analyses of the soil show that there has been but little decrease in the amount of lead arsenate present over the 11-year period.

C. R. Neiswander

Distribute Clover Seeds by Harrowing Cow Pastures.

Cows grazing in the summer on pastures that contain clover consume many clover heads that contain ripe seeds. A large proportion of the seeds have seedcoats that are impermeable to moisture and so pass through the digestive tract undigested and undamaged. That these seeds are capable of sprouting later and producing clover plants was strikingly demonstrated in the spring of 1947 on the Pasture Research Farm at Wooster.

Fig. 8.—This dung pile contained 1,920 seedlings and sprouting seeds

In May it was discovered that the dung piles dropped during the summer of 1946 were producing many ladino clover plants and contained many sprouting seeds. The freezing of the seeds during the winter had made the seedcoats permeable to moisture and the continued wet weather of the spring made ideal conditions for the seeds to sprout.

One such dung pile (fig. 8) was carefully dissected and 1,920 seedlings and sprouting seeds counted. This emphasizes the importance of harrowing cow pastures in the fall or early spring to spread the droppings. In addition to its effect upon soil fertility, this distribution of the clover seeds is one way of contributing to the clover content of the pasture when conditions are favorable for seedling establishment.

L. E. Thatcher and C. F. Monroe

Combined Straw Again Injurious to Clover Seedings

Again in 1947 (*See Farm and Home Research* No. 245 for an earlier report), failure to remove combined straw after wheat harvest resulted in serious damage to the legume seeding in the wheat. Different conditions in the summer of 1946 gave results which were of considerable practical importance in explaining widespread losses of clover stands in Ohio in the winter of 1946-47.

The summer of 1946 was very favorable for clover and alfalfa. By August 20 there was a ton of first-year clover hay on all the experimental plots at Columbus. When this was cut and removed on August 20 the stand came through in excellent condition and

made a large yield in 1947. Where this growth of clover was left over winter, even though the combined straw had been removed earlier, there was a considerable loss of clover stand.

It appears that any accumulation of organic matter greater than 1 ton per acre on top of a new clover stand, whether it be wheat straw, weeds, clover growth, or any combination of these three, is likely to result in damage to the clover stand during the fall and winter (fig. 9). This damage is somewhat proportional to the amount of organic matter above 1 ton per acre left on the field. Clover was much more severely affected than alfalfa. The reason for this dying out of the stand is still not clear.

In 1947, cutting the clover for hay in late August resulted in the stand going through the winter in much better condition regardless of whether the field had been cut and cleaned off earlier. The damage was greater where the wheat straw and clover growth were both left on the land but it was noticeable even when part of the straw had been removed earlier (fig. 10).

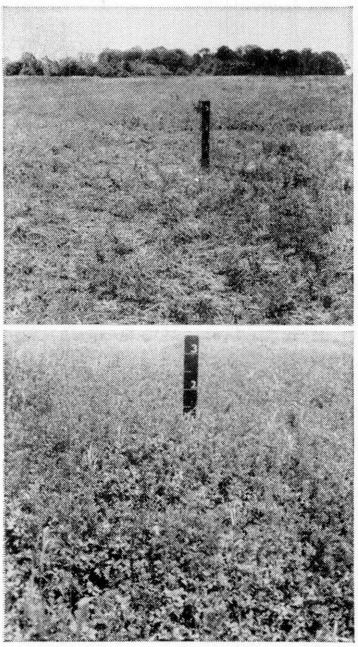

Fig. 9.—Top, no treatment after combining in 1946. Bottom, adjacent plot, cut and material removed, July 13 and August 20. (Photos May 31, 1947 Columbus)

Recommendation: Cut wheat stubble immediately after combining and remove all straw and stubble, or at least remove the loose combined straw at once. If the growth of clover or clover and weeds between then and September 1 is small, that is all that is necessary. If a heavy growth of clover or clover and weeds takes place before September 1, cut the field for hay and remove the material. It should make reasonably good feeding hay, certainly sufficient to pay for the labor of taking it off. Do not cut a new seeding after September 1, or pasture after September 15, in the latitude of Columbus.

C. J. Willard

Improved Strains Outyield Unadapted Canadian Bromegrass

For many years practically all of the smooth bromegrass seed used in the United States was produced in some of the northern states of the

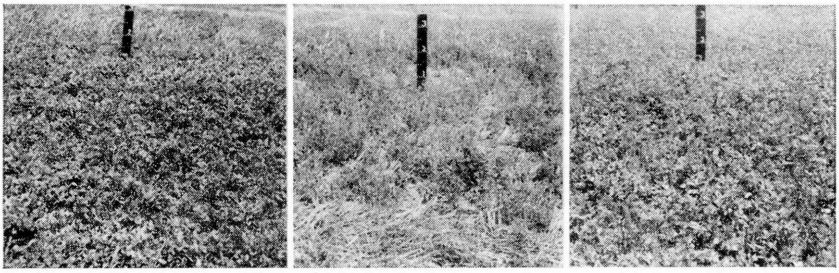

Fig. 10.—Left, cut July 13, 1946, straw removed, no further treatment; center, nothing done after combining; right, same as left, only cut again August 20, hay removed

United States and in Canada. This northern-grown bromegrass is unadapted to the summer climate of the Corn Belt and also suffers from leaf diseases that reduce the yield. For these reasons bromegrass failed to become popular with Corn Belt farmers until new and adapted strains were developed. These so called "southern strains" promise to make smooth bromegrass one of the most popular grasses, especially for midsummer pasture.

At Wooster in 1946, four of the improved bromegrass strains again showed their superiority in yield and disease resistance over the northern strain. The acre yields of hay were: Achenbach (Kansas) 2.89 tons; Lincoln (Nebraska) 2.80 tons; Elsberry (Missouri) 2.65 tons; Fisher (Iowa) 2.62 tons; and northern (Canada) 2.46 tons.

L. E. Thatcher

Residual Effect of Soybeans on Meadow Seedings

Farmers in the Corn Belt have complained for many years that they did not obtain as good seedings of alfalfa and red clover in small grains after soybeans as they did after corn. Experiments at the Ohio Agricultural Experiment Station did not generally bear this out.

For example, in the rotation experiment at Wooster, the yield of clover in the 3-year rotation soybeans-wheat-clover was 3,564 pounds per acre as a 19-year average. The yield in the corn-wheat-clover rotation for the same period was 3,723 pounds per acre, a non-significant difference. Nevertheless, these reports were so insistent that a project was set up to study the problem.

Corn and soybeans were sown in parallel strips on suitable blocks without fertilizer on either crop. After both crops were harvested, plots of wheat or oats were laid out at right angles to

the corn and soybean strips so that each small grain plot crossed both the corn strip and the soybean strip. A mixture of alfalfa and red clover was sown in the small grain by a number of methods. Some plots of small grain were fertilized, some were left unfertilized. When the seedings were made in winter wheat, additional plots were sown in which fertilizer was applied with the legume seed, both on fertilized and unfertilized wheat.

In 1944, 1945, and 1946, thirteen comparisons of alfalfa-clover mixtures sown in wheat as described above were made at five locations, and five comparisons similarly sown in oats at two locations. While there was a definite tendency for the number of alfalfa and clover plants to be less following soybeans than corn, there was only one test in which the differences were obvious and clearly significant. This was at the Northwestern Experiment Farm in 1946, on the most seriously run-down land on the farm. Here there were not only fewer plants following soybeans, but these fewer plants were smaller. This and other observations suggest that the difficulty is due to nutritional deficiencies of some kind.

C. J. Willard and L. E. Thatcher

Pre-emergence Treatment With 2,4-D Looks Favorable

Intensive testing of the new weed killer, 2,4-D, is being carried on by the Department of Agronomy in cooperation with the Sherwin-Williams Company and the Dow Chemical Company. A summary of this work was published in *Farm and Home Research* No. 245.

An extraordinarily promising development in 1947 was the use of 2,4-D as a pre-emergence spray on corn. Corn was planted and the soil treated with varying amounts of 2,4-D immediately after the corn was planted. This resulted in almost complete control of annual weeds for a period of 4 weeks or more (fig. 11).

Fig. 11.—Cornfield 41 days after planting. Left, no treatment; center, 1 pound 2,4-D acid per acre applied to soil at once after planting; right, 2 pounds 2,4-D acid per acre applied as in center

The advantage of this treatment, if it proves as practical as it looks, needs no comment. The first two cultivations of corn, which are the bane of the corn grower in a wet season, could be omitted or at least greatly delayed without injury to the corn. Corn could be drilled and not checked, with equally good weed control. On some soil types the corn might be produced without cultivation but this is not to be generally expected.

In a large number of tests of this kind at Columbus, corn was not injured in stand or yield, but it has been in other tests on other soil types and more work is needed before the method can be recommended without reserve.

C. J. Willard

Horse-nettle Not Easily Killed With 2,4-D

Horse-nettle or Sand-brier (*Solanum carolinense*) is a perennial reproducing by seeds and creeping roots. It usually appears in waste places, pastures, old meadows, and sometimes in cultivated fields. In the latter it can be controlled fairly well through cultivation. In uncultivated areas mowing or close hoeing are usually employed, but these operations are not very effective.

To find if horse-nettle would yield to the new and promising weed killer 2,4-D a small nettle-infested sod area was sprayed with the ammonium salt of 2,4-D August 20, 1946 using strengths of 0.3, 0.4, 0.5, 0.6, and 0.7 percent, each at the rate of 5 gallons per 1,000 square feet. The plots were 10 by 10 feet and the series was placed in what seemed to be the most densely populated portion of the infested area. The number of plants that came up on each of the plots treated at different rates and the number that came up on adjoining untreated plots in 1947 are shown below:

Effect on horse-nettle of 2,4-D applied August 20, 1946

Strength of 2,4-D solution	Number of plants	
	Sprayed	Untreated
Percent		
0.3	10	17
0.4	4	17
0.5	5	13
0.6	9	14
0.7	5	14

The counts, made in October 1947, show that the 2,4-D reduced materially the number of plants but not even the strongest killed all of them. These results seem to indicate that horse-nettle can be killed with 2,4-D but details of the time, rate, frequency, and continuation of application remain to be determined.

C. J. Willard

Late Planting no Longer Controls Corn Borer

Additional evidence was obtained during the year to indicate that delayed planting is no longer the optimum corn borer control measure that it was under single-generation corn borer behavior.

Borer population data on corn planted at different dates and in different localities over the state show that relatively high infestations occurred in the very earliest plantings and again in the moderately late plantings, although not necessarily the latest. The earliest plantings were infested by first generation borers and the late plantings by second generation borers.

Fig. 12.—This injury (11 borers per stalk) was caused entirely by second-generation corn borers (Dayton)

That relatively late plantings may have high borer populations is indicated by noting figure 12, in which is shown a field near Dayton that was planted on May 27. This field had a borer population of 11.0 borers per stalk, all of which were second generation. It now appears that the optimum corn planting time for corn borer control is the same as before the corn borer occurred, that is, a medium date.

Another important change in corn borer behavior observed in recent years is the occurrence of first generation borers in plants other than corn. In 1946, a severe infestation was observed in gladiolus. Similar infestations have been observed repeatedly in potatoes. Borers in potatoes grow more rapidly and a higher percentage of them emerge for a second generation than in corn.

C. R. Neiswander

Niacin and Pantothenic Acid Content of Corn

Recognizing the fact that corn is a universal feed for livestock, a study was undertaken to determine what factors (factor), if any, are involved in affecting the variability in its feeding value. In this study the niacin and pantothenic acid content of corn were under investigation.

Nine double-cross corn hybrids, grown at five experiment stations for 2 years, and the same hybrids grown for an additional year at four of the five stations, were assayed. Variations for both vitamins were found in all hybrids for all 3 years and at all locations. Hybrid difference accounted for the greatest variation in niacin and the year accounted for the greatest variation in pantothenic acid.

Of the nine corn hybrids studied, Iowa 939 averaged the highest in niacin (25.4 mcgm. per gm.) and pantothenic acid (6.4 mcgm. per gm.) for all 3 years and all locations, while Illinois 784 assayed the lowest in niacin (169 mcgm. per gm.), and U. S. 44 and U. S. 13 assayed the lowest in pantothenic acid (4.8 and 4.9 mcgm. per gm.), respectively.

The influence of hybrid and year factors on niacin and pantothenic acid, respectively, indicated that the inherited ability of the plant to develop niacin was less subject to the influence of environmental factors than was the inherited ability of the plant to develop pantothenic acid. However, location, an environmental factor, had a greater influence on the niacin content than on the pantothenic acid content.

C. H. Hunt, Lorraine Ditzler, and R. M. Bethke

Effect of Juices of Higher Plants upon Bacteria

Transmissible lytic factors for bacteria can be developed from juices or water extracts of higher plants and of grains. These lytic factors can be propagated in association with a species of bacteria indifinitely and cannot be distinguished from bacterial viruses or bacteriophages. Extracts of various plants and seeds have vastly different effects upon a culture of bacteria. In some cases, the lytic or inhibitory action is strong while in others it is moderate or weak. As yet we have no basis, except trial, for determining what plant extracts can be used for developing transmissible lysins for a given culture of bacteria.

The active substance in a plant extract which gives rise to the lytic factor is a non-specific precursor which does not become a lysin until it is brought into contact with a culture of bacteria.

Some reaction, as yet unexplained, takes place between the precursor plus the bacteria, resulting in the formation of a lysin specific for the culture. In some cases, such lysins are so highly specific for a species of bacteria that they can be used as a means of identification.

Roy C. Thomas

Vitamin B-Complex Content of Cereals

The plots used for growing the cereals in this test have been in use since 1893. The crops have either been grown in a 5-year rotation or continuous culture.

All cereals were assayed for thiamin, riboflavin, niacin, and pantothenic acid. The results show that there was a consistent increase in the thiamin, niacin, and pantothenic acid content of wheat due to liming the soil, regardless of the type of fertilizer used. The same was true regarding the thiamin content of oats and corn. There was no evidence that fertilizers, irrespective of kind, or lime had any effect on the riboflavin content of wheat, corn, and oats. Year affected the niacin content of oats. This effect had a positive correlation with the percentage hull content and a negative correlation with the weight per bushel.

Generally speaking, the production of thiamin, niacin, and pantothenic acid was more constant in wheat than in oats and corn.

C. H. Hunt, Lorraine Ditzler, F. A. Welton, and R. M. Bethke

Sod Crop in Rotation Influences Wheat Yield and Lodging

In the Fry Farm crop rotation studies at Wooster, there are four 3-year rotations that differ only in the kind of a sod that is plowed down for the corn. In 1946, the wheat yields and amount of lodging were influenced by the kind of sod plowed for the 1945 corn crop: this appeared to be correlated with the amount of nitrogen returned to the soil by the sod crop.

The lowest acre yield of wheat, 37 bushels of grain and 2,600 pounds of straw, was obtained in the timothy hay rotation that contained only a small amount of volunteer alsike clover. This thin wheat was standing perfectly at harvest time.

The next to the lowest yield was 40 bushels of grain and 3,300 pounds of straw in the red clover rotation. Although this wheat was heavy and leaning at harvest time it did not lodge.

The next highest yield, 47 bushels of grain, was in the alfalfa rotation. However this wheat was lodged considerably at harvest time and this certainly reduced the yield. This rotation produced the highest yield of straw, 4,500 pounds to the acre. Had this wheat not lodged it likely would have produced the top grain yield.

The top grain yield, 49 bushels, was produced on 4,000 pounds of straw and was in the rotation of mixed clover-alfalfa and timothy. This wheat was lodged only about half as badly as the wheat in the alfalfa rotation.

The wheat in the different rotations all received the same fertilizer, 300 pounds of 0-14-7 per acre.

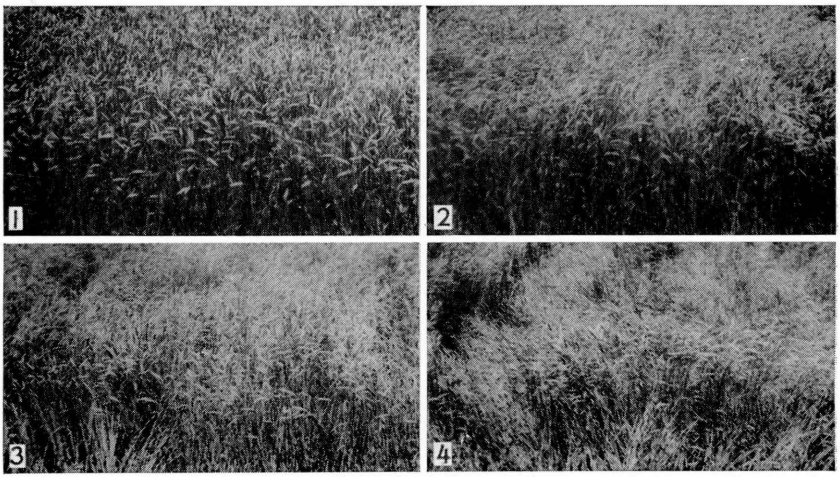

Fig. 13.—Wheat just before harvest in 3-year rotations of corn, wheat, and hay. The hay differs in each rotation and the kind of sod is reflected in the yields and lodging of the wheat: (1) Timothy sod, wheat thin, no lodging; (2) clover sod, wheat heavy but upright; (3) alfalfa-clover-timothy sod, wheat lodged some; (4) alfalfa sod, wheat lodged badly

L. E. Thatcher and R. E. Yoder

Fruits

Malus Baccata not Satisfactory as an Understock

Malus baccata has proved disappointing as an understock for apple trees at Wooster.

In 1937 two rows of apple trees, the roots of which were Malus baccata, were planted in adjacent orchard rows at the Experiment Station. Twenty trees had been top-worked to Virginia Crab for an intermediate stock, while Hibernal was used as intermediate stock on an equal number of trees.

In 1940 these trees were top-worked by whip grafting to Blaxtayman, Grimes Golden, and Golden Delicious. The first fruit of any consequence was borne in 1944. Practically all of the trees, whether the intermediate stock was Virginia Crab or Hibernal, were dwarfed. All of the trees were apparently poorly anchored in the soil.

Most of the trees in the row having Virginia Crab as an intermediate stock tended to be prostrate at harvest time. This characteristic was not so noticeable in the row having Hibernal for an intermediate stock. Even though the central leader on the Virginia Crab row might bend with the weight of the apples almost to the ground, there was comparatively little breakage. Apparently the Virginia Crab as an intermediate stock has the faculty of imparting limberness to the top. This tendency has also been noted in Hibernal in tests in other states.

Malus baccata has been used in severe climates as an understock to avoid winter injury of the roots. From the limited test reported here, it seems of doubtful value for Ohio orchards. It may have some possibilities in use for dwarfing stocks.

C. W. Ellenwood

Nitrogen Nutrition of Peach Trees

For many years research workers have studied the effect of nitrogen on the green color of plant leaves. In some cases attempts have been made to determine the relationship between leaf color, nitrogen content of the leaves, and plant growth. Such correlations are difficult to secure because the texture and green tones of leaves are not easily matched with standard color charts. Also, research workers vary in their ability to recognize various colors and therefore the results secured in different laboratories may vary considerably.

For the past 2 years a photoelectric reflection meter has been used as a means of determining the color of peach leaves from trees receiving varying amounts of nitrogen fertilizer. This method is very accurate and appears to eliminate the difficulties encountered in attempting to evaluate leaf color by comparing with a color chart.

The reflection meter used in these tests is essentially a photoelectric cell with a colored glass filter which measures shades from light to dark as would be seen by the eyes. The results are obtained from a galvanometer on the indicating instrument. This type of equipment has been used for some years by the ceramic and paint industries in standardizing colors and determininig loss of color upon weathering.

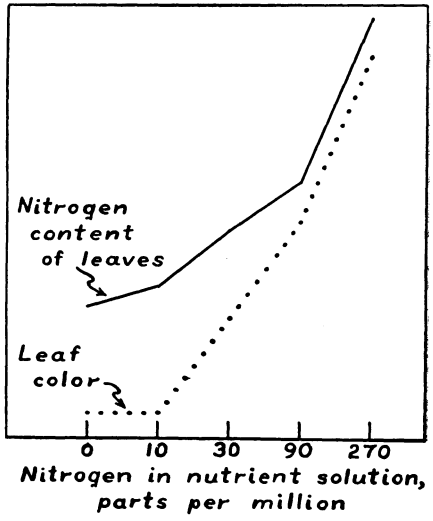

Fig. 14.—This chart shows correlation between nitrogen content of peach leaves and leaf color of 1-year-old trees. The trees were growing in sand supplied with nutrient solutions containing different amounts of nitrogen. The nitrogen content of the leaves ranged from 1.8 to 3.4 percent while the leaf color values varied in a similar manner

The data secured in these tests show a close correlation between leaf color, leaf nitrogen, and growth of 1-year-old peach trees in sand nutrient solution culture. Similar correlations were also secured for 1-, 2-, and 3-year-old trees growing on Wooster silt loam soil.

The reflection meter appears to offer real promise as a means of measuring differences in the color of leaves or other plant parts or horticultural products. The tests are being continued to determine the value of this instrument as a means of diagnosing the nitrogen status of fruit trees growing under orchard conditions and the possibility of using such data in recommending the amounts of fertilizer which should be applied.

Wesley P. Judkins

Stone Fruit Virus Diseases

Surveys conducted during several seasons indicate that the virus diseases of stone fruits are becoming more prevalent and damaging each year.

This is especially true in the case of cherry yellows. In the spring of 1947, it was found that from 10 to 75 percent of sour cherry trees in various commercial orchards of the Clyde-Fremont area were affected by this disease. Cherry yellows is materially reducing cherry fruit yields.

Examination of several newly-planted orchards revealed the fact that many of the trees in such orchards were affected by yellows. This would indicate that the disease is being spread by nursery trees. It was further found that only a very small number of sour cherry trees are propagated by Ohio nurseries and that most of the commercial cherry orchards being planted are started with out-of-state nursery trees.

In view of the increasing danger to the stone fruit industry brought about by the spread of virus diseases, a nursery certification program was started in Ohio in the spring of 1947. This program is being conducted jointly by the Experiment Station and the Ohio Department of Agriculture with the voluntary cooperation of the nurseries propagating stone fruit trees.

H. F. Winter

Benzine Hexachloride Controls Plum Cucurlio

A block of peach and one of plum trees in an orchard of Ottawa County has been employed in plum curculio studies during each of the past three seasons. The curculio population was determined each year by rearing the larvae from the drop fruits collected at frequent intervals. In order to compare the populations during the three seasons, the number of larvae obtained during each 5-day period is shown graphically in figure 15.

As indicated in the figure, larval emergence was later and extended over a longer period in 1947 than in either of the two previous seasons. This condition, brought about by unusual weather conditions, made control more difficult even though the total population was relatively small. The usual shuck-fall and first-cover sprays do not protect the fruits during July and August. This season a second and in some cases a third cover spray was necessary to control the curculio satisfactorily. However, four applications of lead arsenate may cause severe foliage injury on either peaches or plums.

The results of curculio studies carried on during both 1946 and 1947 indicate that in case of a severe infestation, benzene hexachloride may be substituted for lead arsenate with good results.

Three pounds of a commercial brand of benzene hexachloride (containing 6 percent gamma isomer) per 100 gallons of water were used during 1947. On both peaches and plums, five applications were made at 10-day intervals beginning at petal fall. This schedule caused no foliage injury and left no undesirable flavor on the fruit. It resulted in an average of but 5 larvae per tree as compared with 34 where the standard lead arsenate schedules were used.

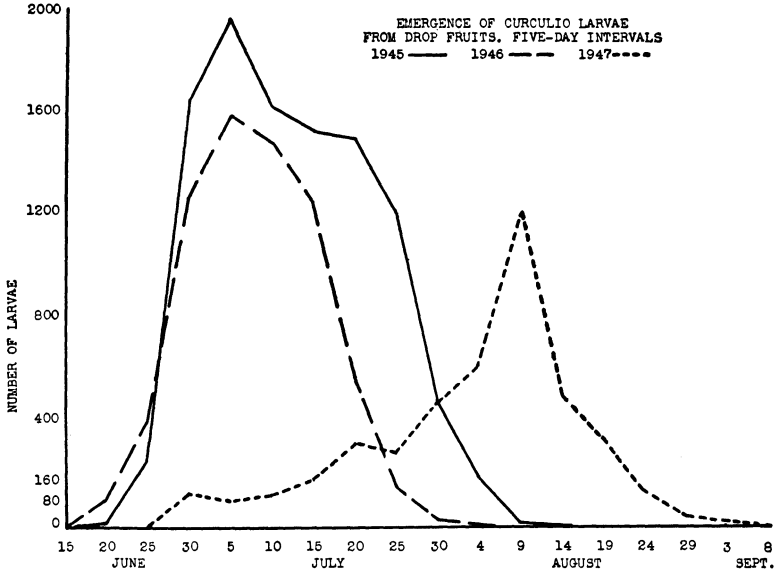

Fig. 15.—Emergence of curculio larvae by 5-day periods for the years 1945-1947

In another series of plots where benzene hexachloride at the same strength was applied three times at 10-day intervals, beginning with the shuck-fall spray, an average of 14.5 larvae per tree was obtained.

R. B. Neiswander

European Red Mite Control

Sprays containing DDT have proven very efficient in the control of codling moth in Ohio apple orchards. However, other pests, particularly the European red mite, tend to increase in numbers when DDT is used. For this reason, much effort was devoted to the problem of mite control during the 1946 season.

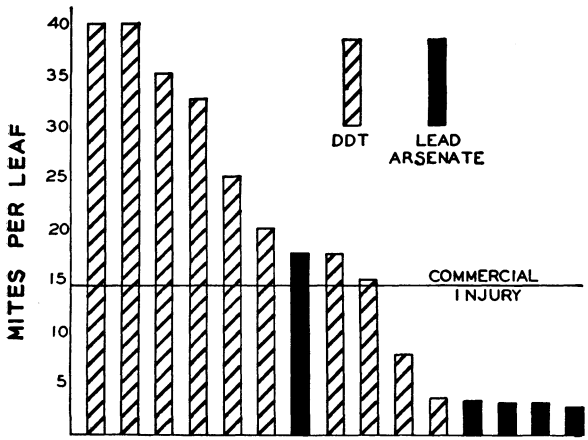

Fig. 16.—Data taken in 15 Ottawa County orchards show that mites increase where DDT is used. Each column represents one of these orchards

In general, three types of experiments were conducted: (1) Those in which acaricidal or mite killing materials were used before applications of DDT were made; (2) those in which the acaricides were combined with DDT sprays; and (3) those where acaricides followed the use of DDT.

Experiments of the first type showed conclusively that acaricides such as oil could be applied in the spring and that control of mites for most of the season would follow, if the spraying were done thoroughly. Control by this method is especially good during June and most of July.

In the second and third types of experiments, all available acaricides that could be used in summer were collected and tested in combination with DDT for their effects on mites and the general condition of the fruit and foliage. Approximately 75 different spray schedules of this character were field tested in 1946. From these tests, it was found that combinations of summer oil and DDT injured both foliage and fruit. Other combinations were safe to foliage and fruit but not especially effective against mites. The material finally determined as best suited for summer use against mites was summer dinitro in the formulation known as DN-111.

DN-111 generally is quite effective in killing mites and also has some residual effect against individuals that hatch subsequent to the time of spraying. It is usually safe on foliage if not combined with sulfur, lime, or oil, and if applied when temperatures are 85° F. or lower. It is by no means the perfect acaricide but until better materials are developed, it is the best practical spray for summer use against red mite in Ohio apple orchards.

C. R. Cutright

Vegetables

Manuring Fails to Maintain Soil Porosity

Bumper crops of potatoes are produced only on soil that remains loose and porous throughout the growing season. When properly plowed, most soils are well suited for the crop at the outset but during periods of heavy rain they settle and become too compact. Some of the potato roots then die and the plants slowly turn yellow and die down prematurely. However, virgin soils and those left in sod for several years commonly have a granular, crumb-like structure that withstands the compacting of heavy rains.

The problem of growing potatoes successfully on silt loam and heavier soils in Ohio becomes one of developing and retaining a suitable soil structure. Generous application of manure to Wooster silt loam has failed to do this. Convincing evidence is found in a fertilizer experiment at Wooster on land cleared from forest in 1894. One plot of this experiment has been manured at the rate of 16 tons per acre every time potatoes have been grown.

During the first 39 years of the experiment, a 3-year rotation of potatoes, wheat, and clover was used. At the outset, good potato crops were obtained, but the yield gradually declined. The rotation was then shortened to potatoes, wheat with sweetclover, and since 1941 potatoes have been grown annually with a rye cover crop. Thus during the 52 years of the experiment, some plots have been manured 22 times.

Wooster silt loam has been found to need a porosity of 50 percent to insure good potato crops. The actual porosity of the plot manured at the rate of 16 tons per acre (22 times) in 52 years was only 48.8 percent after the heavy rain of June 1946. On an adjoining plot, fertilized, but never manured, the porosity was 46.8 percent. Similarly, the water-stable soil granules over 0.25 millimeters diameter in the manured soil was only 7.5 percent and in the unmanured soil 4.5 percent. Correspondingly, the yield on the manured plot was 232 bushels and on the fertilized plot 206 bushels per acre. Considering the care that was given the crop, this is not a good yield. On a nearby field where an old, sod-covered orchard had been removed, the soil had a porosity of 51 percent and yielded 437 bushels of potatoes per acre.

The results of this experiment, supported by many related tests, explain the gradual decline in acreage of potatoes in Ohio since 1900. Ordinary farm practice, even with liberal manuring, does not insure proper tilth for potatoes. As soils have gradually become more compact, potatoes have become an unprofitable farm enterprise on many farms. At the same time, the crop has become more intensively grown on sandy loams and on mucks that drain rapidly and remain loose and porous throughout the growing season.

John Bushnell

New Materials for Spraying Potatoes

DDT, used in combination with Bordeaux mixture, gave a 34 percent larger yield (an average increase of 121 bushels per acre) than was obtained when calcium arsenate was used with the same fungicide.

DDT completely eliminated the potato leafhopper as a factor in limiting production. It was superior to Rhothane, Methoxy analog of DDT, and benzene hexachloride in the control of leaf hoppers and flea beetles when all were applied at comparable rates of the active ingredient.

DDT gave moderate control of the green peach aphid when applied regularly at 10-day intervals throughout the growing season but it was less effective against the pink and green potato aphids. The data indicate that benzene hexachloride may be of value in the control of aphids, especially during epidemic outbreaks. Excellent control of the Colorado potato beetle and blister beetles was obtained with DDT.

Zerlate was equal to or better than Bordeaux mixture in the control of early blight, whereas it was less effective in the control of late blight.

Dithane D-14 and Parzate gave good control of late blight. A mixture of Zerlate and Parzate effectively controlled both early and late blight.

Thoroughness in spraying or dusting is essential if maximum results are to be secured. All the foliage must be covered with the pesticidal formulation and this coverage must be maintained throughout the growing season. Applications should be made at 10-day intervals and it is suggested that growers apply 70-75 pounds of dust or 200 gallons of spray per acre when the plants have reached maximum foliage development (usually when in bloom).

Dusts should be applied to moist foliage, since initial deposit and final adhesion are increased.

J. P. Sleesman and J. D. Wilson

Effect of Adding Oils to Fixed Copper Dusts for Potatoes

Corvus oil was used at 3, 5, and 8 percent by weight in dust mixtures that also contained COC-S, EM23 talc, and Diluex.

There was little or no difference in copper adhesion or disease control (early and late blights) between the mixtures containing 3 and 5 percent of oil, but that containing 8 percent was slightly injurious to the potatoes. Neither was there any appreciable difference in the same factors between Corvus, S. E. C., Vaporol, and Sunvis oils when used at 5 percent by weight in other mixtures. The addition of 15 percent Celite to a COC-S-talc mixture gave slightly better results than when it was not included.

J. D. Wilson

Disease Resistance in the Tomato

Selection and yield trials have been continued for the purpose of developing Fusarium wilt resistant varieties of tomatoes adapted for glasshouse and field culture. The work to develop a glasshouse type has progressed the fastest and one selection has yielded 29.5 percent and 8.8 percent more than the standard Globe variety for the spring and fall crops of 1946, respectively. These increased yields were obtained on wilt-free soil. On wilt-infested soil the new selection has looked even better. Fruit shape and quality appear to equal that of Globe.

Selections and crosses directed toward the development of a canning type are being continued, but none of them appear to be ready for introduction.

Work with the interspecific cross *Lycopersicon esculentum* × *L. peruvianum* var. *humifusum* has been continued. This material is in the third generation and ready to be tested for resistance to the leaf spot diseases. The most important leaf spot diseases of canning crops are early blight and Septoria late blight. In addition these lines may carry genes for resistance to some of the virus diseases.

L. J. Alexander

Tobacco Mosaic Disease of Glasshouse-grown Tomatoes

Two experiments were conducted to determine the extent to which the tobacco mosaic virus lives in the soil from one crop to the next; one with the spring crop and one with the fall crop of 1947. Both experiments were conducted in commercial glasshouses.

In the spring crop 28 percent soil transmission occurred when an interval of only 10 days elapsed between removal of an old infected crop and the planting of a new crop. When 21 days elapsed, the infection dropped to 2.5 percent and to 1.8 percent when the interval was increased to 31 days. In the fall crop with an elapse of approximately 10 days between removal of the infected crop and the planting of a new crop, 15.3 percent of the plants were infected. When the time interval was increased an additional 10 days, the infection fell to 4.7 percent.

In one experiment, four types of tobacco were assayed to determine if they carried the virus. Of ten brands of chewing tobacco, one was found to carry mosaic in low dilution. Of the ten brands of pipe tobacco, three were found to carry virus; of ten cigarette brands, eight were found to carry the virus; and of ten brands of cigars, one was found to carry the virus.

A tobacco mosaic resistant clone of the species *Lycopersicon hirsutum* was secured from the U. S. Department of Agriculture to use as a source of resistance to the disease. Crosses were made between this species and the varieties Bonny Best and Globe of the domestic species *L. esculentum.* The F_1 progenies of both crosses segregated for resistance and susceptibility, thus indicating that the original clone was heterozygous for resistance. The manner of inheritance of resistance to the tobacco mosaic disease is unknown.

L. J. Alexander

Large Versus Small Tomato Seed

Large and small seeds were selected by hand from three hybrid and three naturally-pollinated tomato varieties. The object was to determine whether there might be a difference in yielding ability in plants growing from these seeds. The differences in yield between the large and small seeds within a normally-pollinated variety were not great, but they were in favor of the large seeds. The size of the individual fruits and the number of tomatoes produced were slightly greater in each case.

The plants from the large seeds within the hybrids produced from 1 to 6 pounds per plant more fruit than those from the small seeds. The number and size of fruits were greater in all cases. These tests indicate that it might pay to grade tomato seed for size in greenhouse use.

I. C. Hoffman

Vitamins Affect Commercial Mushroom Yields

The vitamins used were thiamin, riboflavin, niacin, calcium pantothenate, and pyridoxine hydrochloride. The first treatment was applied to the plots before the casing soil was put on the beds and the rest were made each 2 weeks during the season. In all, 14 applications were made.

All vitamin treatments produced more than the checks. In a previous trial (1946), the niacin-treated plot produced slightly less than the check. This year it caused the largest percentage increase of all the vitamins.

I. C. Hoffman

Fertilizers for Vegetable Crops on Sandy Soil

A fertilizer experiment with four vegetable crops was started at the Washington County Truck Crops Experiment Farm, Marietta, 32 years ago. At the outset, the Chenango sandy loam appeared to have an abundance of phosphate and potash, nitrogen being the only fertilizer needed. In the course of 32 years of continuous cropping the picture changed. The need for phosphate and potash fertilizers became evident, with potash needed in larger amounts than phosphate.

Today, the fertilizer needed nearly balances with the constituents removed by the crops. The removal of potash is five times that of the phosphoric acid. The experiment, however, was not laid out to test such a combination; the present recommendation, based on actual experimental results, is to apply three times as much. The recommended formula is thus 8-4-12.

The crops vary considerably in the amounts needed. For example, early cabbage needs 1,200 pounds while sweet corn needs only 400 pounds per acre.

The 8-4-12 fertilizer does not supply enough nitrogen for some crops, particularly in cool, wet seasons. Since nitrogen applied before planting may be partly leached away, the economical procedure is to apply some additional nitrogen fertilizer as a side dressing after the plants are well started rather than to increase the amount in the initial fertilizer.

John Bushnell

Spraying Celery Increases Yield

When 14 different spray formulas were applied to celery foliage in an experiment on the Muck Crops Experiment Farm at McGuffey only one failed to increase the yield slightly over that of unsprayed plots, even in the absence of leaf blights.

One fungicide gave a slight reduction, three gave slight increases in yield, and six gave increases ranging from 12 to 20 percent. Formulas containing sulfur, which were formerly thought to have some nutritive value, caused yield increases of only 9 percent.

J. D. Wilson

European Corn Borer in Sweet Corn

Timely applications of DDT either as a spray or dust continued to give effective corn borer control in early planted market garden sweet corn. Photographs of characteristic ears from treated and untreated plots are shown in figure 17.

C. R. Neiswander

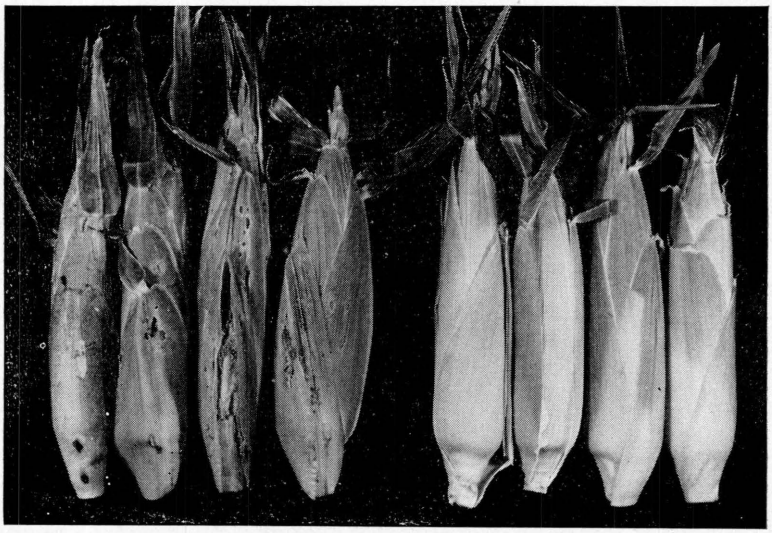

Fig. 17.—Ears on left from unsprayed sweet corn plants. Ears on right from plants sprayed four times with DDT used at the rate of 1 pound to 100 gallons of water.

Average Response of 30 Tomato Varieties to Spraying

Thirty varieties of tomatoes, which included several of recent introduction, as well as four commonly used in the canning industry, were planted in double rows in replicated plots. Alternate rows were then sprayed with Zerlate (2-100) at 10-day intervals for six applications from July 20 to September 8.

The average response of all 30 varieties to spraying is indicated by the following values—spraying increased the number of fruits by 11 percent; the total yield was increased by 94 percent; culls were decreased by 56 percent, anthracnose by 90 percent, and late blight was reduced by 70 percent.

The yield of Earliana was increased by 66 percent and anthracnose, to which this variety is very susceptible, was decreased 88 percent by spraying. The net yield of usable fruits was increased from 3.8 to 10.3 tons per acre. The response of the late maturing varieties to spraying was considerably less than that of early ones.

J. D. Wilson and H. A. Runnels

Ornamental Plants

Bacterial Wilt and Root Rot of Carnations

In experiments designed to determine the relative susceptibility of carnation varieties to bacterial wilt and root rot the following five varieties were found to be immune to the disease: Dairy Maid, Peter Fisher, Dark Pink Fisher, Marchioness of Headfort, and Olivette.

Varieties which could be classed as fairly resistant were Dimity, Tom Knipe, Patrician, Northland, Seth Parker, Matchless, Pink Abundance, Virginia Hercules, Virginia Salmon, Virginia, White Fisher, Casablanca, Number 16 Red, Scarlet King, Red Spectrum Supreme, Briery, and Derigo.

Dorothy Napier, Woburn, Pollyanna, Maine Sunshine, Virginia Rose, Lenora, Yellow Gold, Maine Gold, Pelargonium, Puritan, Rosalie, C. W. Weld, Coronet, Light Pink Abundance, Elizabeth Rowe, Virginia Supreme, Virginia Dark Pink, Virginia Dare, and Vivian were susceptible, but the disease did not spread extensively from inoculated to healthy plants in these varieties.

Varieties in which the disease spread extensively and which proved to be extremely susceptible were King Cardinal, Charm, Spitfire, and Miller's Yellow.

Good control of bacterial wilt has been obtained by selecting healthy propagating stock, rogueing the young plants before and after benching to remove diseased individuals, and sterilizing the soil.

Paul E. Tilford and John Alger

Warm Water Application to Soil

The temperature of water applied to greenhouse plants during the late fall, winter, and early spring averages 45 to 50° F. It has been assumed that this cooling action reduces the rate of absorption and growth of the roots of plants.

Water heated to a temperature of 75° and 90° F. was found to be more detrimental than the use of 45° F. water with tests on roses, cyclamen, and azaleas. It appears that a water temperature between 60° and 70° would be most desirable.

Alex Laurie and D. C. Kiplinger

Lilies

A number of varieties of lilies are available to be used for Easter flowering. Tests have shown the Croft and related types are better suited for pot plants because of their short growth and high bud count. The Mexican, Creole, and Floridi types are taller in growth and are lower in bud count, making them most useful as cut flowers.

Alex Laurie and D. C. Kiplinger

Selenium

The application of sodium selenate to the soil at ¼-gram per square foot is effective for the control of red spider, aphids, and some other pests on several soft-stemmed ornamental greenhouse plants. Absorption by the plant and leaching from the soil make application every 3 months necessary. Overdoses may be corrected by application of gypsum at 5 pounds per 100 square feet and watering in heavily.

Alex Laurie and D. C. Kiplinger

Constant Water Level Subirrigation

The watering of cut flower crops and pot plants is simplified and labor is reduced where constant level subirrigation is employed. For cut flower crops, a level, water-tight bench is necessary and a 2-inch layer of gravel overlaid with 1 inch of sand is the most suitable foundation for the 4 to 6 inches of soil normally used in greenhouse benches.

The water level is maintained by a float valve in the layer of sand. For pot plants, a level, water-tight bench is necessary with a 2-inch layer of gravel overlaid with 3 to 4 inches of sand. The pots are placed on the sand and the water level is maintained 1 to 2 inches below the bottom of the pots. The method shows considerable promise for many plants.

Alex Laurie and D. C. Kiplinger

Rose Propagation

The greenhouse rose is difficult to propagate by cuttings. A lack of understanding of the proper environmental factors has been responsible for most of the losses sustained. The results of numerous variations in environment indicate that a greenhouse rose cutting should be 4 inches long bearing one leaf.

The rooting medium should be a medium-fine sand or vermiculite and the bottom heat should be 70° to 72° F. An air temperature of 50° F. has given best results.

Covering the cuttings with newspaper or cloth is detrimental unless the light intensity is greater than 2,000 foot candles, in which case the entire propagation house should be shaded. A relative humidity of 60 to 70 percent gave best results with higher humidities causing leaf drop.

Alex Laurie and D. C. Kiplinger

Prepackaged Flowers

The packaging of cut flowers indicates that flowers will keep out of water as satisfactorily as similar flowers in water, provided proper methods and materials are used.

Fresh flowers are placed in a waterproof box and sealed with a gas-tight, moisture-proof, transparent film which is heat-sealed. The box is then placed in storage at 45° F. and may remain at this temperature for periods of 5-10 days depending on the type of flower. This method of presentation of flowers for selling will enable outlets to display the boxes in open refrigerated cases rather than in the conventional containers of water in an icebox.

Alex Laurie and D. C. Kiplinger

Propagating Woody, Ornamental Plants

The experiments with cuttings have dealt mainly with the influence of different mediums, watering methods, and artificial light on the rooting of cuttings of deciduous and evergreen plants.

Vermiculite (No. 1) and Silica Sand (No. 7) have given excellent results, as has a mixture of equal parts of these two materials. Overhead watering and forced subirrigation have proved superior to a constant level method of watering. Placing cuttings in an opaque structure with fluorescent lights did not prove successful.

Handling evergreen grafts on an open bench in a house with controlled relative humidity of about 90 percent proved to be as successful as when the grafts were placed in closed cases in the usual way. Experiments with root stocks for Juniper grafts are in progress.

L. C. Chadwick

Soil Aggregation Studies

Mulching tests with roses showed that ground corn cobs gave excellent bloom production and better soil aggregation than clean cultivation, a peat moss mulch, or living mulches of Portulaca, alsike clover, or Chewings fescue.

A companion crop of alsike clover improved soil aggregation and gave increased caliper growth of several types of small shade trees in the nursery over those grown under clean cultivation.

L. C. Chadwick

Pre-storage Defoliation

Such materials as Elgetol, Ammonium nitrate, Cyanamid, Nacconol NR and HG, Alpha Naphthaleneacetic acid, Dinitro-O-Secondary Butyl Phenol, and Sodium Arsenite were used as pre-storage defoliation sprays. The results obtained to date indicate that 2 percent Nacconol NR with 3 percent safe oil can be used safely and economically in the nursery for pre-storage defoliation of several ornamental trees and shrubs as well as small apple and possibly peach trees.

L. C. Chadwick

Japanese Beetle

1947 Weather Conditions Affect Beetles

Drought during the late summer and early fall of 1946 retarded the development of Japanese beetle larvae to such an extent that approximately 60 percent of the larvae went into winter hibernation less than half grown.

Then again the cold, damp weather in the spring of 1947 caused a further delay in the development of the insect from the grub to the adult stage. As a result of these climatic conditions the appearance of adult beetles was delayed as much as 1 to 3 weeks in different sections of the state, while the period in which the greatest number of beetles were in flight was delayed as much as a month.

Fig. 18.—Section of golf course in northern Ohio showing turf injury caused by grubs of the Japanese beetle.

The weather conditions in the spring of 1947 seemed to have been responsible for the delay in the infection of the larvae by the spores of the milky disease.

The greatest percentage of milky disease infection is usually found during the second week in June throughout the beetle infested area. In the summer of 1946 the infection peak occurred at that time, but in 1947, at both Cleveland and Youngstown, only a few infected larvae were found in June and the peak was not reached until August 10.

J. B. Polivka

Migration of Adults into New Territory

Dry weather during the beetle flight period of 1946 had no apparent effect in reducing the distance the adults migrated into new territory. In fact, in areas where surveys were conducted in 1946, it was found that the migration of the adult into new territory was greater than it had been for either of the two preceding years. For example, in the Guernsey County area, the insect was found in 22 square miles of new territory in 1944, 18 square miles in 1945, and 48 square miles in 1946. Observational surveys conducted in the Youngstown and Cleveland areas indicated a similar behavior of the adult.

J. B. Polivka

Beetle Control Measures

Several of the newer insecticides have shown some promise in controlling the adult of the Japanese beetle. The outstanding materials used in 1946 were a 10 percent gamma isomer hexach-

Fig. 19.—Elm tree in July, showing partial defoliation caused by Japanese beetles.

lorocyclohexane dust, a 2 percent chlordane dust, and a DDT spray consisting of 1 pound of actual DDT in 100 gallons of water. The beetle population on peach trees sprayed or dusted with these insecticides was less than one-fourth of the population found on untreated trees.

When DDT sprays were compared to DDT dusts, it was found that equal amounts of actual DDT gave similar controls with only slight variations in the residual effect, regardless of the nature of the application.

Some of the newer soil insecticides have been found to be as effective in controlling the larvae of the Japanese beetle as is lead arsenate as far as immediate control is concerned. DDT in addition to giving a high initial kill, when applied at the rate of 25 pounds of the actual material per acre, has also shown a residual effect for a period of 2 years. At the end of 1 year, hexachlorocyclohexane (containing 6 percent gamma isomer) applied at the rate of 2.5 pounds of the gamma isomer per acre and chlordane applied at the rate of 5.0 pounds per acre have given results comparable to DDT. These materials have an advantage over lead arsenate in being cheaper and less toxic to plants.

J. B. Polivka

Food and Clothing

Calcium and Phosphorus in the Diet

The calcium and phosphorus metabolism of nine young adult women was observed. The basal diet was constant in calcium and phosphorus content and at a minimum level for adequacy—0.3 grams and 0.8 grams, respectively.

Supplements to the calcium and phosphorus content of the basal diet were provided by tablets of calcium carbonate, calcium diphosphate, and sodium glycero-phosphate. The supplements were fed in such proportions as to provide calcium at two levels, 0.6 gram and 1.2 grams daily, and phosphorus at two levels, 0.3 gram and 0.6 gram daily. These supplements in addition to the calcium and phosphorus provided by the basal diet, yielded calcium to phosphorus ratios of from 1:0.5 to 1:4.7.

These data are now being analyzed statistically. Indications are that the ratio of calcium to phosphorus, as well as the level of the minerals in the diet affect the retention of these minerals by the individual. Notable individual variation among the nine subjects was observed.

Mary Brown Patton and Eva Donelson

Effect of Crushed Ice Refrigeration on Vegetables

Earlier work had indicated that crushed ice refrigeration favored the retention of both vitamin C and weight in freshly-harvested vegetables. It seemed that information was needed concerning the use and acceptability of this type of refrigeration in the display of vegetables in the retail market.

Therefore a project was planned in cooperation with a national food chain firm and the Ohio Association of Ice Industries to make observations in two retail stores in Columbus, Ohio. The routine of each store was studied during three periods: (1) as usually operated; (2) when one-half of the vegetables were displayed in an iced tray, and the other half in a dry tray; and (3) when all vegetables were displayed in an iced tray. This study would seem to indicate that crushed ice refrigeration reduced the amount of spoilage, sloughing, and shrinkage over the amount experienced under some of the practices used in the display of vegetables in retail stores.

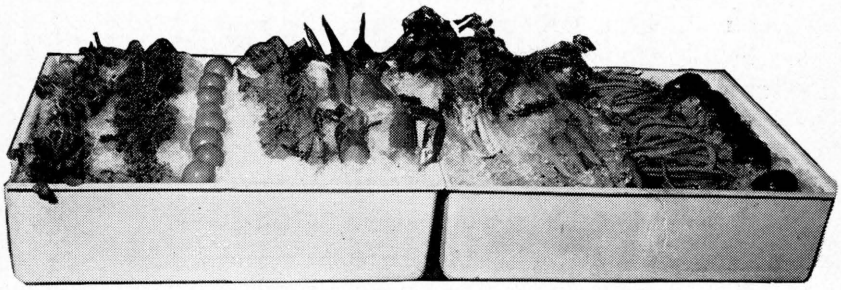

Fig. 20.—A crushed ice display attracts the eye of the grocery shopper.

Several problems for study became evident during the progress of these projects. One of considerable importance to Ohio farmers is the use of crushed ice during transportation of vegetables from the farm to the local markets. Another has to do with merchandising practices in the use of ice in the display of vegetables in retail stores. The type of tray and selection of water-proof containers for some of the small vegetables need further study.

Mary Brown Patton

Carotene and Vitamin C in Leafy Vegetables

Experiments testing the effect of fertility levels on the carotene and ascorbic acid contents of leafy vegetables showed, in general, that any level of nitrogen, calcium, manganese, magnesium, boron, or iron which reduced the intensity of the green color of leafy vegetables also reduced the carotene content.

Significantly higher ascorbic acid values were obtained in chard from plots where nitrogen, magnesium, manganese or potassium levels were low. Similar results were also obtained from kale and New Zealand spinach.

H. D. Brown and Mary Brown Patton

Snap Beans Suitable for Freezing

During the summer of 1946, 16 varieties of snap beans were grown in irrigated fertile plots at Columbus, harvested at the optimum stage of maturity, frozen at –20° F. and held in storage 4 to 6 months at 0° F. At the end of the storage period the snap beans were cooked in distilled water for 12 minutes and then rated on the basis of color, flavor, and texture by a panel of three judges. The best varieties, using this method of evaluating, were Giant Stringless Greenpod, Stringless Keystonian, Asgrow Valentine, and Bountiful.

The beans were also assayed for Vitamin C content. They varied from 2.59 to 20.87 milligrams per 100 grams. The varieties which showed the greatest amount of vitamin C were Bountiful, Sure Crop Wax, Improved Golden Wax, and Plentiful.

H. D. Brown and Wilbur Gould

Fabrics

Twist tests were completed. The differences in yarn twist were not great. In general, the filling yarns of fabrics of the heavier flannel type had lower twist than the corresponding yarns in the lighter-weight serge types.

Laundered fabrics were tested for yarn count, thickness, and weight. In every case, laundering caused an increase in yarn count, the increase being greatest in the filling direction. The fabrics made from a blend of rayon and casein fiber increased in thickness and weight after laundering, while the all-rayon fabrics remained the same or decreased slightly in thickness and weight.

Calculations were made on data for breaking strength and elongation of the fabrics. In general, the dry elongation increased after laundering in the case of rayon and casein fiber blends. The dry elongation of all-rayon fabrics was slightly higher on the warp after laundering, but the opposite was true in the filling direction.

Florence Petzel

Clothing Construction

Of the types of pocket corners tested during the year, diagonally stitched corners with taped reinforcement were strongest, followed by diagonally stitched corners without tape, and pockets stitched into seams. Of the factors tested in relation to the breaking strength of pocket corners, the kind of fabric and the kind of corner construction appeared to be most important; length of stitch had an appreciable effect, and kind of thread was least important.

Among the seams broken perpendicular to the direction of pull, flat fell seams were strongest, French fell seams were weakest, but plain seams, lapped seams, and French seams differed little in strength. The strength of seams tended to increase with increasing length of stitch. Six-cord, unmercerized thread gave the strongest seams, and seams stitched with 3-cord mercerized thread were somewhat stronger than those stitched with 2-cord mercerized thread.

Florence Petzel

Forestry

Maple Syrup Production

The factors which influence the returns from maple sugar products in Ohio are being studied in a project initiated in February 1946. Foresters and rural economists are conducting the project.

Fifty-eight cooperators, located in Geauga County, are keeping cost and income figures. During the short season of 1946 these 58 farmers hung 1,142 buckets on the average and made 139 gallons of syrup. The average cost per gallon of the 58 producers was $3.49, ranging from $1.72 to nearly $8.00.

On 57 percent of the farms the cost was lower than the ceiling sale price of $3.39 in spite of the short season. There was a high degree of correlation between gallons of syrup produced and cost per gallon. The bushes having the greater production also had the lower costs.

O. D. Diller

Measurement of Hybrid Poplars

In 1940 and 1941, 10 selected strains of poplars, developed by the Dow Chemical Company, were planted on a farm near Utica, Ohio (Carey Wagner). The cuttings were planted in a corn field on Miami silt loam, next to hills of corn at a spacing of approximately 6 by 6 feet. The trees were cultivated three times during the first season with no subsequent cultivation. The cuttings were planted by means of a spade made from a piece of steel 3 inches wide, one-half inch thick, and 10 inches long.

During the year following the planting a heavy volunteer stand of mammoth clover covered the ground and this was followed by goldenrod, aster, ragweed, and wild carrot.

The number planted, survival, height growth, and percent which were cankered at the time of measurement in October, 1946 were tabulated. The data show that survival ranged from 2 to 91 percent and the number which were attacked by canker fungi ranged from 43 to 98 percent for the various strains. Average height growth per year ranged from 8.4 to 2.0 feet. Variety No. 67 made the greatest growth and showed the least injury from canker, making an average annual height growth of 2 feet. Forty-three percent of the stems showed canker injury.

From the data obtained in the Wagner plantings it is apparent that none of the hybrids tested show promise for planting elsewhere in the state.

O. D. Diller

State Forest Lands Purchased

During the year 19 tracts of land were paid for and transferred to the state. These tracts totaled 11,742 acres. The largest single purchase was the Ernest Flagg land in Scioto and Adams Counties which contained 8,947 acres. Additions were made to six state forests during the year.

O. A. Alderman

Reforestation

Trees grown and distributed for reforestation totaled 3,202,640 of which farmers planted nearly one-half. About one-third of the stock went to mining companies. Of the farmers receiving trees, 68 percent were new cooperators, 32 percent having planted trees in previous years.

The demand for stock so greatly exceeded the supply that plans are being made to establish a new nursery in the northern part of the state.

R. R. Paton

Forest Fires

Nine hundred and sixty-one fires were suppressed during the year. These fires burned over 6,055 acres of woodland and 9,173 acres of grass or idle lands.

It was of interest to note that fires discovered by means of airplane patrol burned an average of 6.35 acres of woodland while fires in the region where lookout towers are used burned an average of 6.24 acres per fire. The higher ratio of grass land to woodland in the plane area would tend to increase the acreage of land burned over due to the more rapid spread of fire in grass.

J. A. Bastian

State Forest Timber Sales

Gross sales of timber from state forest lands amounted to $86,223. This figure compares with $54,461 for the previous year.

The volume of timber cut was 2,505,567 board feet or about one-fourth of the estimated growth.

Lower grades of hardwood are in less active demand and since much of the timber being marked for sale is defective it is likely that lumber sales may drop off during the years ahead.

B. E. Leete

Weather

For the Year 1946

General weather conditions at the Ohio Agricultural Experiment Station for the calendar year of 1946 were not greatly different from the 59-year averages. However, six all-time high and two all-time low daily temperature records were broken. Temperatures were nearly normal with an excess of 1.4 degrees for the year. A notable exception from normality was the month of March with an excess of 11.8 degrees over the 59-year average.

The year was notable for unique weather records in two instances. The 53-year average number of clear days is 140. In 1946, 204 days were recorded as clear, a record never passed and only equalled in 1939. The 53-year average annual snowfall is 30.96 inches. The 1946 record shows that only 6.45 inches fell, a condition which partly accounted for the deficiency in total precipitation. Eight of the months were below average in rainfall, the year ending with a deficiency of 3.23 inches, with August showing the greatest deficiency—2.27 inches.

Dates of last killing frost in the spring and earliest in the fall are April 28 and October 13, indicating a growing season of approximately 168 days, about 2 weeks longer than average.

The annual climatological summary for Wooster and the State of Ohio was printed in the May-June, 1947 *Farm and Home Research* of the Ohio Agricultural Experiment Station, Volume 32, Number 246. Similar data for the previous 58 years may be found in previous bulletins of this Station.

J. T. McClure

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(As of June 30, 1947)

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Superintendent	*Farm*	*Location*
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HAROLD M. RACER	Washington Co. Truck Exp. Farm	Marietta
H. W. BLACK, *Proj't Supervisor*	Soil Conservation Exp. Farm	Zanesville
	Northeastern Experiment Farm	Strongsville

DECEASED: Dr. J. H. Gourley, Chief in Horticulture, October 27, 1946; and Dr. J. S. Houser, Chief in Entomology, June 21, 1947.

[1]In Cooperation with the U. S. Department of Agriculture.
[2]Stationed at Columbus.
[3]Stationed at the Reynoldsburg Animal Disease Laboratory.
[4]Stationed with the Ohio Division of Forestry at Chillicothe.

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FARM SCIENCE AND PRACTICE

BULLETIN 674 66th Annual Report FEBRUARY, 1948

OHIO AGRICULTURAL EXPERIMENT STATION
WOOSTER, OHIO

SUPPLEMENT---JANUARY, 1949

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FINANCIAL STATEMENT

July 1, 1946—June 30, 1947

ASSETS AND LIABILITIES

ASSETS

Current Assets	$ 176,533.70	
Contingent Assets	3,280,736.49	
Land	1,258,494.11	
Land Improvements	70,222.29	
Buildings	778,476.56	
Departmental Equipment	968,652.96	
Total Assets		6,533,116.11

LIABILITIES

Capital Account	3,252,379.62	
Special State Appropriations	3,280,736.49	
Total Liabilities		6,533,116.11

INCOME AND EXPENDITURES

INCOME

Cash Balance July 1, 1946	172,461.05	
Appropriations by State Legislature	1,201,951.38	
Appropriations by U. S. Government	263,614.43	
Sale of Produce, etc.	301,671.70	
Total Income		1,939,698.56

EXPENDITURES

Salaries	490,166.26	
Employees and Extra Labor	437,746.04	
Stationery and Office Supplies	6,369.79	
Incidentals	10,786.58	
Laboratory Supplies	10,751.21	
Materials and General Supplies	138,615.25	
Repairs to Equipment	19,851.50	
Telephone and Telegraph	5,499.30	
Freight and Cartage	4,803.71	
Travel	18,952.78	
Feed	71,428.89	
Fertilizer	3,868.44	
Apparatus	10,670.39	
Furniture and Fixtures	8,024.57	
Machinery, Tools, etc.	18,873.36	
Library	3,077.97	
Livestock	24,150.53	
Land	396,353.82	
Buildings	83,174.47	
Total Expenditures		1,763,164.86
Cash Balance June 30, 1947		176,533.70
Total		1,939,698.56

(By W. R. Vaughn, Office Manager)

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